

JPRS-UST-94-010  
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# ***JPRS Report***

# **Science & Technology**

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***Central Eurasia***

# Science & Technology Central Eurasia

JPRS-UST-94-010

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# PHARMACOLOGY AND PHYSIOLOGY

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**Dismissal of CW Committee Head Kuntsevich Criticized**

94P50126A Moscow *SEGODNYA* in Russian  
9 Apr 94 p 2

[Dmitriy Frolov article "Lateral Move: Generals Come and Go, Chemical Weapons Remain"]

[Text] General Anatoliy Kuntsevich, chairman of the Committee for Convention-Related Problems of Chemical and Bacteriological Weapons, has suffered a defeat. His dismissal by an edict of the president of the Russian Federation was arranged according to the new Russian traditions: The press knew about it before Kuntsevich's co-workers did. The formulation was also mysterious: "for a single gross violation of his labor responsibilities." Isn't the president giving us to understand that Mr Kuntsevich all but unleashed chemical war? One way or another, the general, who at first ran

the military-chemical complex, but then took upon himself the responsibility for its destruction, turned out to be unsuitable.

Apparently, it is considered that the incident is thus closed. Vil Mirzayanov, who let the city and the world know about the existence of Russian binary weapons, can now relax: Lefortovo [prison] no longer threatens him. The moral victory of the "military-chemical dissident" is plain to see. As for whether the problem itself has been solved—that is still unclear: 40 thousand tonnes of chemical weapons [CW]—which is just what has been officially declared—as before have nowhere to go outside Russia, and must all the same be destroyed. Besides which, no fundamental decisions have been made about the use of more or less safe technologies for destruction of CW in Russia. One can hardly expect that just a few personnel shifts will help.

## CHEMISTRY

**Electrodiffusion Through Inhomogeneous Ion-Exchange Membrane With Adjacent Diffusion Layers**

947M0043A Moscow ELEKTROKHIMIYA in Russian  
Vol. 30 No. 1, Jan 94 pp 35-40

[Article by N.P. Gnusin, N.A. Kononenko, and S.B. Parshikov, Kuban State University, Krasnodar; UDC 541.183.12]

[Abstract] Electrodiffusion continues to arouse interest in connection with electromembrane processes for treating natural waters and industrial solutions. Together, an ion-exchange membrane and diffusion layer form a three-layer region. Boundary value problems formulated for the said region can only be solved by using differential transfer equations characteristic for each of the layers and by sewing together the boundary conditions at the boundaries of regions. Many investigators have attempted to solve this type of problem; however, none has been entirely successful. A new approach to describing electrodiffusion transfer through an inhomogeneous ion-exchange membrane with adjacent diffusion layers has been proposed. It does not require specific determination of model representations of the composition and structure of the membrane material. Instead, the new approach assumes that the ion exchanger is microinhomogeneous and that its kinetic properties are formed under conditions of local thermodynamic equilibrium at the specified dimensional microlevel. At the same time, a Nernst-Planck equation of electrodiffusion transfer that takes into account the structural distinctions of the structure of the ion-exchange material through a type of concentration dependence of electrodiffusion transfer coefficients is used at the higher level. The link between the electrodiffusion transfer coefficient and the concentration coefficient is determined from data obtained in independent experiments to establish the membrane's diffusion and electric conduction properties. The use of the new approach is illustrated, and the dependence of the maximum current density and current efficiency on membrane thickness, nature and concentration of the solutions used, and parameters characterizing the membrane's properties is analyzed. The proposed approach to solving a boundary value problem for a fragment of an electrodiffusion system is said to pave the way to describing problems of electromass transfer in electrodialysis devices. Figures 6, table 1; references 10: 8 Russian, 2 Western.

**Indirect Electrochemical Processing of Coal**

947M0043B Moscow ELEKTROKHIMIYA in Russian  
Vol. 30 No. 1, Jan 94 pp 124-125

[Article by G.Ya. Voronkov, G.I. Martsinkevich, and A.M. Skundin, Electrochemistry Institute imeni A.N. Frumkin, Russian Academy of Sciences, Moscow; UDC 541.138.2:547]

[Abstract] The possibility of electrochemical processing of coal has been discussed in a number of recent publications. Several publications have described attempts at direct anodic oxidation of coal. Several other groups of investigators have studied the kinetics of indirect oxidation of coal; however, the composition of the oxidation products has not yet been definitively established. In the most recent attempt at indirect electrochemical processing of coal, solutions containing hypochlorite and  $\text{Fe}^{3+}$  solutions were used as oxidizing agent-carriers. Active chlorine solutions were prepared by electrolysis of a 3-5 percent NaCl solution in an electrolyzer without separation of the anode and cathode spaces. Samples of the following types of coal were studied: the bituminous coal G6 from the Kuznets Basin, which has an average particle size of 57 mm and an ash content of 5.7 percent; the bituminous coal B from the Berezovskoye Deposit, which has an average particle size of 38 mm and an ash content of 6.2 percent; and the lignite B2 from the Podmoskovnyy Basin, which has an average particle size of 21 mm and an ash content of 23.7 percent. The sulfur content of the three samples amounted to 0.48, 0.52, and 4.3 percent, respectively. Treatment of all three coal samples with a solution containing active chlorine in amounts up to 1 g/l resulted in noticeable disintegration of the coal particles. After processing, the average particle sizes of the G6, B, and B2 coal samples decreased to 28, 8.5, and 3 mm. The most interesting aspect of the said processing was the liberation of hydrogen gas (along with CO and  $\text{CO}_2$ ). The composition of the processing products depend significantly on the temperature and pH of the active chlorine solution. The dependence of product composition on pH was especially pronounced at low temperatures. Infrared spectroscopy studies established that the liquid products of oxidation of the coal contain carboxylic acids. Carbonic acids and other liquid oxidation products were only discovered in the processed lignite. Processing of the lignite resulted in significant liberation of  $\text{CO}_2$  and CO (at rates of about 50 and 13  $\text{cm}^3$  gas/h/kg coal). No CO was liberated when the bituminous coals were processed, and they only liberated  $\text{CO}_2$  at rates up to 20  $\text{cm}^3$ /h/kg. Processing raised the ash content of the lignite (from 23.7 to 31 percent) and decreased that of the bituminous coals. As a result of processing, hydrogen was liberated from the bituminous coals at a rate of 1-2  $\text{cm}^3$ /h/kg coal and at a rate of 26  $\text{cm}^3$ /h/kg from the lignite. The mechanism of liberation of hydrogen gas when the coals were processed in an active chlorine solution remained unclear; however, two hypotheses as to its origins were offered: (1) the liberation of a finite amount of hydrogen when the coal reacts with the active chlorine is linked to transformations of the nitrogen-containing products in the coal, and (2) the liberation of hydrogen is linked to the effect of the acid on the sulfide inclusions in the coal. The definite correlation discovered between the rate of hydrogen liberation and the sulfur content of the coal specimens and the fact that hydrogen liberation was observed only when the coal was processed with acidic oxidizing agent solutions were said to be evidence in favor of the latter hypothesis. Figures 2; references 12: 1 Russian, 11 Western.



**Analysis of Superconducting Materials Based on La-Sr-Cu by Ion-Pair Chromatography**

947M0046A Ivanovo *KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA* in Russian Vol. 36 No. 12, Dec 93 pp 27-30

[Article by A.V. Padarauskas, Analytical Chemistry Department, Vilnius University; UDC 543.544.6]

[Abstract] A new method has been developed for quick determination of lanthanum, strontium, and copper in superconducting materials of the La-Sr-Cu type by an ion-pair chromatography-based technique that makes use of complexing. The new method was developed on a Tsvet 3006 ion chromatograph with a conductometric detector. Steel columns (100 x 6 mm) filled with the sorbent silasorb C<sub>18</sub> (particle diameter, 10 µm) were used for the separation. A water-acetonitrile solution of lithium octylsulfonate with a tartaric acid additive served as the mobile phase. The mobile phase was filtered through a glass filter and degassed under a vacuum. The mobile phase was fed in at a rate of 2 ml/min, and a volume of 30 µl specimen was introduced. Twice distilled water was used along with reagents graded "pure for analysis" or "chemically pure," and the concentration of metals in the starting solutions was established by complexometric titration. Separation of the study cations was optimized by varying the concentration of lithium octylsulfonate and acetonitrile in the mobile phase. The optimum mobile phase was determined to be a solution of  $1.0 \times 10^{-3}$  M lithium octylsulfonate and  $5.0 \times 10^{-4}$  tartaric acid in an 80:20 mixture of water and acetonitrile. The proposed method made it possible to determine La, Sr, and Cu with a standard deviation not exceeding 0.03 and with only insignificant systematic error without preliminary separation of the metals, which increases analysis speed significantly. No more than 20 minutes is required to analyze one sample, which is 5 to 10 times less than the amount of time required with chemical and photochemical methods. Figures 2, tables 3; references 7: 4 Russian, 3 Western.

**Lithium Battery With a Solid Polymer Electrolyte**

947M0047B Ivanovo *KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA* in Russian Vol. 36 No. 10, Oct 93 pp 88-92

[Article by S.S. Popova, L.N. Olshanskaya, G.P. Denisova, and G.A. Raspopova, Electrochemical Production Process Department, Saratov Polytechnic Institute; UDC 621.355.9]

[Abstract] Researchers conducted a comparative study of a prototype current source with a negative electrode made of an Li-Al alloy and a positive electrode based on a C<sub>8</sub>CrO<sub>3</sub> layered graphite compound. A solution of lithium perchlorate in an organic solvent (a 1:1 mixture of propylenecarbonate and dimethoxyethane) or thin cellulose acetate-based polymer film that conducts lithium along ions served as the electrolyte system. The primary objective of the comparative study was to obtain experimental proof of the intercalation of lithium

cations into the structure of the C<sub>8</sub>CrO<sub>3</sub> electrode from the polymer electrolyte by taking discharge curves and studying the electrodes' operation in a cycling mode. The electrodes were prepared by heat-treating a mixture of CrO<sub>3</sub> and graphite and then intercalating F-42L fluoroplastic (10 percent) as a binder and PME-90 graphitized black (40 percent) in the form of a suspension that was rubbed onto a titanium base, rolled, and dried to a constant weight. The negative electrode was prepared from aluminum foil by treating it in a working solution of lithium perchlorate (1 mol/l) in a 1:1 propylenecarbonate and dimethoxyethane mixture at a potential of -2.90 V for 3 hours. A standard silver chloride electrode in a solution of 1 mol/l lithium perchlorate with a 1:1 propylenecarbonate and dimethoxyethane mixture saturated with LiCl served as the normal electrode. Also studied as negative electrodes were Li<sub>x</sub>C lithium intercalation compounds that were synthesized electrochemically on a graphite cathode in solutions of lithium salts in acetonitrile at lithium intercalation potentials of -2.6 to -3.4 V. LiC<sub>12</sub> and LiC<sub>6</sub> were the lithium intercalation products. The studies of the prototype LiAl/C<sub>8</sub>CrO<sub>3</sub> current system with a cellulose acetate-based polymer solid film electrolyte confirmed that such a current source is capable of discharging for a long time at voltages above 2 V with current densities of 0.025 to 0.19 A/cm<sup>2</sup>. The following values were recorded during tests of the prototype current source: prototype's volume,  $0.06 \times 10^{-3}$  dm<sup>3</sup>; Q<sub>3</sub>,  $7.0 \times 10^{-3}$  ampere-hours [Ah]; Q<sub>3</sub> (up to U<sub>3</sub> = 3.8 V),  $12.0 \times 10^{-3}$  Ah; unit-area capacitance [Q<sub>n</sub>], 1.16 Ah/cm<sup>2</sup>; specific energy [W], 0.245 Wh/dm<sup>3</sup>; and power density [P], 16.3 W/dm<sup>3</sup>. Figures 4, tables 2; references 9: 7 Russian, 2 Western.

**Study of Vanadium-Oxygen Nanostructures on Surface of Pyrolytic Graphite**

947M0041D St. Petersburg *ZHURNAL PRIKLADNOY KHIMII* in Russian Vol. 66, No. 8, Aug 93 pp 1818-1825

[Article by S. D. Dubrovenskiy, A. V. Shchukarev, A. A. Malkov, A. A. Malyging, and S. M. Portnov, St. Petersburg Technological Institute AO "Mekhanobr-Analit", St. Petersburg; Physical Problems SRI imeni F. V. Lukina, St. Petersburg; UDC667.529:546.13]

[Abstract] The present work is a continuation of a study of the synthesis of regular nano-structures on the surfaces of solid matrices as possible materials for nano-electronics and its study using scanning tunnel microscopy. Pyrographite plates were used as substrates in accordance with the specifics of scanning tunnel microscopy. Nanometer-size structures were formed on the surfaces by chemical modification of transition metals and phosphorus with halogens. The first results indicated that pyrographite treated with vanadium oxychloride had the most structure ordering. Therefore, the present work was devoted to studying the surface composition of vanadium oxychloride-modified pyrographite using X-ray photoelectron spectroscopy. It was demonstrated that the carrier gas used (air, nitrogen, or helium) plays a significant role in the concentration of elements on the surface layer as well as the shape of the



V  $2p_{3/2}$ , Cl  $2s$ , O  $1s$  lines in the photoelectron spectra. A comparative analysis of the spectra of modified pyrographite with the bulk oxygen compounds of vanadium led to the hypothesis on the structures formed on the pyrographite surface are similar in nature to that of hydrated vanadium oxide. The concentration and degree of polycondensation of surface structures are determined by the oxygen content in the carrier-gas. Figures 3; references 6 (Russian).

### Technology for Producing Construction Materials From Toxic Waste

947M0039A Moscow ROSSIYSKIYE VESTI in Russian  
10 Mar 94 p 13

[Unattributed article: "Keramzit Obtained From Poison"]

[Text] A technology developed at the Keramzit Scientific Research Institute in the Samara region makes it possible to transform toxic wastes from the electroplating industry into nontoxic keramzit [clay concrete].

Industrialists know how expensive it is to neutralize the heavy metal salts contained in electroplater wastes. That is why most enterprises prefer to get rid of them by dumping them in sewers or by "hiding" them at a special site. And that is extremely dangerous.

The technology proposed by the scientists is simple and inexpensive. The heavy metal salts added to the mixture during annealing end up in a glassy melt and become part of a safe construction material.

According to specialists' calculations, the Samara Oblast alone dumps 70,000 metric tons of toxic electroplating wastewaters. But that is just a drop in the bucket for the oblast's keramzit plants, which can process 20 times that amount. All that is required are additional tanks at the keramzit plants to store the electroplating wastewaters and vehicles to transport the wastes.

### Design Calculation for Individual Sorption-Type Respirators With Cyclic Air Movement

947M0041A St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol. 66, No. 8, Aug 93 pp 1734-1736

[Article by A. A. Krimishteyn, S. V. Plotnikova, V. I. Kononov, and B. V. Putin, Chemistry SRI, Tambov, Chemical Machine Building Institute, Tambov; UDC614.894]

[Abstract] In a previous work, a mathematical model was presented for an individual respiratory device having a reciprocating type system of air movement. Another group of individual respirators employs a cyclic system, where the exhaled air passes through a layer of regenerative product into a breathing bag; on inhalation, the air passes from the breathing bag to the face mask. The advantage of the cyclic system over that of the reciprocating system lies in a lower temperature

of the inhaled air and less respiratory resistance, thereby improving the ergonomic characteristics of the device. Due to the two-way passage of air through the regenerative product in the reciprocating devices, the regeneration process is intensified, and for this reason these devices received greater dissemination. However, this advantage holds only for relatively small devices. The proposed model may thus be used to determine which system of air movement is most effective in any given case. In the present work the model was expanded to include devices designed to the cyclic system of air movement and used to compare the two systems. Figures 2; references 2 (Russian).

### Sorption Dynamics of Benzene Vapors on Carbon Fiber Materials

947M0041B St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol. 66, No. 8, Aug 93 pp 1787-1791

[Article by G. N. Shikhaleeva, T. A. Asaulova, A. S. Chistov, and A. A. Ennan, Physical Chemistry and Environmental Protection Institute, Odessa; UDC541.183.661]

[Abstract] The ecological use of carbon fiber sorbents for effective removal of toxic gases and vapors from atmospheric air has become pressing. Vapors of organic solvents, such as benzene, are present in the vented wastes of various chemical enterprises, and the study of the sorption dynamics of these compounds is essential for the development of sorption methods of air treatment and the design of ecological equipment. In the present work some results are presented on a study of the sorption dynamics of benzene vapors on carbon foam fibers. The lengths of the mass transfer zones, the unused layer heights, and the coefficients of protection for various through-put rates and benzene vapor concentrations were determined. The dynamic characteristics of the sorption process as a function of the vapor-air mixture were determined by Forsythe approximation of the data. Figures 3; references 10 (Russian).

### Fiber-Ionites for Treating Effluents for Chromium (VI) Ions

947M0041C St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol. 66, No. 8, Aug 93 pp 1792-1797

[Article by N. V. Bytsan, Ye. I. Turkin, L. V. Yemits, G. M. Mubarakshin, and S. V. Burinskiy, Textiles and Light Industry Institute, St. Petersburg; UDC546.91:541.183]

[Abstract] The need for treating electroplating effluents for highly toxic chromium (VI) ions is brought about by the high PDK (maximum allowable concentration) of this substance in the water system. Thus, the PDK for chromium is set at 0.1 mg per liter, while its actual content in the effluents is as much as 13-100 mg per liter. The widely used electro-coagulating reagents used for this purpose fail to provide a high enough degree of chromium ion elimination. Ion exchange methods appear to be the most effective means of providing a high

degree of water purification, especially that of fiber ionites which are characterized as having higher rates of adsorption and greater ease of regeneration, in comparison with resin forms. In the present work PAN-AN-1 and PAN-AS-1 are recommended as fiber sorbents for leaching out chromium (VI). These are analogs of anionite exchange resins AN-18 and AV-17, used for the same purpose. PAN-AN-1 is diethylamine modification of an epoxy-containing grafted copolymer of polyacrylonitrile fiber, and has a static exchange capacity for low basicity tertiary amines of 3 mmoles per gram. PAN-AS-1 is obtained by treating the above copolymer with trimethylamine. It contains high basicity trimethyloxypopylammonium groups in amounts to 1.3 mmoles per gram. Anion exchange capacity of the ionites comprises 2 mmoles per gram. Tests show that these sorbents are effective in eliminating chromium (VI) from electroplating effluents. Figures 6; references 10 (Russian).

## CHEMICAL INDUSTRY

### Utilization of Petroleum Residues to Prepare Adsorbents

947M0041E St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol. 66, No. 8, Aug 93 pp 1853-1857

[Article by Yu. V. Pokonova and A. I. Grabovskiy, Technical Institute, St. Petersburg; UDC661.183.123]

[Abstract] One of the leading trends in research is the modification of coal-derived adsorbents with various additives, such as shale kerogen, liquid products of shale, and petroleum residues, which significantly enhance both their sorption properties and their selectivity in leaching out metals from solutions. The present work is a study of the relationship between the composition and nature of the charge in the preparation of adsorbents from coal with petroleum asphaltites and their by-products for the purpose of determining the most active form for the adsorption of arsenic from effluent water. An adsorbent, derived from coal dust and containing 8 percent moderately concentrated asphaltite (66 percent asphaltites), was found to have a sorption capacity to extract arsenic from effluents that is 1.5-1.8 times greater than the best foreign or domestic products. References 7: 5 Russian, 2 Western.

### Polishing Systems Based on Ultra-Finely Dispersed Diamonds

947M0041F St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol. 66, No. 8, Aug 93 pp 1878-1881

[Article by T. M. Gubarevich and V. Yu. Dolmatov, Special Design-Technological Bureau "Tekhnolog," St. Petersburg; UDC666.233.621.685]

[Abstract] Many branches of modern industry require higher standards in the quality of material surfaces. This is especially true for electronics where it is the surface itself that often provides the required physical effects

and operating conditions in micro-circuits. The status of a prepared surface is determined by depth of the treated layer, roughness parameters, optical cleanliness, lack of defects and structural wholeness of the treated material during the finishing and super-finishing processes. Highly perfected surfaces of optical and semiconductor devices are obtained by chemical-mechanical polishing methods. These methods are based on using polishing compositions which include colloidal non-abrasive particles in a solid phase acting as carriers of certain functional groups which react chemically with the treated surface. The liquid phase contains a combination of chemically active additives which regulate the chemical, transport, and mechano-chemical processes in the system polisher-polishing composition-treated material. Colloidal systems based on ultra-dispersed amorphous spherical modifications of silica particles (aerosils) proved to be effective. However, there are limitations in the use of aerosils in these compositions resulting from the insufficient chemical stability of the silica particles in certain chemically active media, and the insufficient hardness of the silica particles. In the present work the properties of a new class of ultra-dispersed materials, clustered diamonds made by detonation synthesis (ultra-dispersed diamonds) were examined. A study was made of their chemical stability in corrosive media, surface properties, morphology and aggregation, and a technology for preparing polished surfaces with them was developed. Polishing compositions containing these diamonds and a liquid medium such as water, mono- and poly-hydric alcohols (glycerine, ethylene glycol), were tested in the super-finishing of semiconductors (silicon, germanium, gallium arsenide), optical crystals, metals and alloys, and gemstones. The polishing resulted in high-quality surfaces lacking in defects such as scratches, fissures, or etching residues and having roughness parameters of 1-2 nm. References 8 (Russian).

### Synthesis and Properties of Polysulfone-Polysiloxane Block Copolymers Produced Under Conditions of Heterophase Polycondensation

947M0047A Ivanovo KHIMIYA I KHIMICHESKAYA TEKHNLOGIYA in Russian Vol. 36 No. 10, Oct 93 pp 81-84

[Article by L.K. Burygin, Organic Chemistry Department, Tver State University; UDC 541.64.043.3]

[Abstract] Polysulfone-polydimethylsiloxane block copolymers based on  $\alpha,\omega$ -bis(chloroformiatemethyl)oligodimethylsiloxanes with an  $(AB)_n$  structure and regular alternation of rigid and flexible chains were synthesized under conditions of heterophase polycondensation. Triethylamine was used as a polycondensation catalyst, and the starting reagents were used in concentrations of 0.01-0.02 mol/l. Most of the block copolymers produced had two brittle points reflecting the properties of their component blocks. In all but one case (i.e., the copolymer with the composition 4600-900), the brittle point of the siloxane phase was low and weakly dependent on the molecular mass

of the siloxane block. The siloxane phase was found to be rather pure, and its properties were only slightly dependent on the molecular mass of the polysulfone fragment. The brittle point of the polysulfone fragment increased as its molecular mass in the block copolymer increased. The gas permeability of the newly synthesized block copolymers increased as the content of polysulfone blocks decreased. A sharp increase in gas permeability coefficients was discovered in cases of a 50-60 percent content of flexible blocks and was considered evidence of the occurrence of a phase inversion process. Decreasing the amount of siloxane blocks in the block copolymer resulted in an increase in the breaking stress of specimens produced from a solvent good for both blocks (chloroform). The new block

copolymers remained stable when heated in air to temperatures up to 300°C regardless of the composition or molecular mass of the polysulfone block. Film specimens of the new block copolymers possessed good hydrolytic stability. After one hour of exposure in a 20 percent hydrochloric acid solution, the new block copolymers lost only 0.04 percent of their mass. After one hour in a 40 percent potassium hydroxide solution at 80°C, they only lost 0.4 percent of their mass. Thanks to their high deformation and strength characteristics, gas permeability, and thermal and hydrolytic stability, the newly produced block copolymers were recommended for use in creating coatings and gas-separating membranes. Figures 2, table 1; references 3 (Russian).

### Optimal Systems To Detect and Classify Moving Objects

947G0018A Moscow KIBERNETIKA I SISTEMNYY ANALIZ in Russian No. 3, Sep 93-Oct 93 (manuscript received 23 Oct 91) pp 137-145

[Article by V. N. Koval, Yu. V. Kuk; UDC 519.21]

[Abstract] This article uses Neumann-Pearson criteria to find an optimal information processing system to detect moving objects. In some area of space there may be an unknown random number of moving objects. The trajectories are described by some random processes which are typically assumed to be Markov processes. In a special case, the trajectories may be deterministic. The object parameters, coordinates, speed, etc. are unknown. Each object belong to one of  $N$  classes of objects, and the class is also unknown. Signals distorted by noise in the medium in which they are moving are received from the objects. The noise has a random probability distribution density which may or may not be correlated. The system must detect objects when they appear in the monitored area, classify each object (determine what class the object belongs to), and determine its parameters. It is assumed that a multi-channel system with narrow intersecting beam patterns is used. An optimal system is derived. References 5 (Russian).

### New Principle for Constructing Cryptographic Modules in Computer Protection Systems

947G0018B Moscow KIBERNETIKA I SISTEMNYY ANALIZ in Russian No. 5, Sep 93-Oct 93 (manuscript received 8 Jan 92) pp 42-50

[Article by A. A. Moldovyan, N. A. Moldovyan; UDC 681.3]

[Abstract] This article examines a new principle of organizing cryptographic conversions which fully considers computer system capabilities and provides optimal construction of fast software modules in complex computer protection systems. A set of unified modifications of this method has been constructed. Significant protection against cryptanalysis is provided by the password selection method. A unique cryptographic key is formed for each user. The key is a block of 1-, 2-, or 4-byte numbers. The user selects a password, which is then lengthened to the required size. Thus, password size is a variable. Several key formation algorithms are presented. Encryption is done in two steps. No less than two samples from the key are taken in each step of the operation. The number of variants which may be obtained using this method is a factor of  $10^{45}$  greater than the number of possible keys in the DES system. The method has been implemented in the KOBRA system, which controls user access and is easy to use. The system uses 3 kB of resident memory, and 200 kB of disk memory. Programs have been written which provide a coding speed of 200-500 kB/s at 16 MHz with a 16-bit microprocessor. Figures 2; tables 2; references 11: 10 Russian, 1 Western.

### Multiple Identification of Optical Readings in Multisensor Information and Measurement System

947K0055A St. Petersburg IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY. PRIBOROSTROYENIYE in Russian No. 4, Apr 93 (manuscript received 10 Jul 91, signed to press 24 Sep 93)

[Article by S.A. Ivanovskiy and A.A. Pervozvanskiy, St. Petersburg State Electrical Engineering University imeni V.I. Ulyanov (Lenin), Chair of Software and of Computer and Calculating Systems Application; UDC 621.37: 621.391]

[Abstract] An information and measurement system is considered which includes  $K_o$  observers, each with  $K_s$  optoelectronic scanners on board moving in space. A set of objects is assumed to be moving in space in a known manner, some of them having been already observed earlier and the pertinent data recorded in a special catalog. The remainder of them has not yet been logged. The observation time is subdivided into equally long periods. It is furthermore assumed that, by a preliminary processing of the readings taken by one scanner, it is possible to estimate the state vector of a given object at the beginning of an observation period and evaluate the covariance matrix of the estimation error. There arises the problem of identifying the readings, namely of referring each to objects in the catalog or to one of the new objects, or to the set of spurious ones. Because an object can give more than one reading, it is expedient to tackle this problem by solving the relevant sequence of destinations problems where the set of readings taken within one observation period has been broken down into those three subsets and each of the identification hypotheses defined accordingly. The problem of identifying the set of readings taken within one observation period can thus be reduced to the problem of maximizing a certain functional which is defined on the set of all hypotheses and is proportional to the probability of the given one. The exponential dependence of the total number of hypotheses on the number  $M$  of measurements and on the number  $N$  of objects already in the catalog makes the identification problem so unwieldy that complete sifting through the hypotheses is not always feasible. A simpler procedure is, therefore, proposed: sifting the hypotheses in two stages, with fewer hypotheses to be sifted in each stage. In the first stage the entire set of known objects is subdivided into groups ("clusters"), namely into components of connectedness on a bilobate graph where the vertices represent all known objects and readings. Arcs are drawn to connect vertices when distances between them are smaller than a given threshold length. In the second stage the series of identification problems is solved separately for each cluster. Because one object can give more than one reading, a heuristic multistep algorithm is required for this procedure. The cost matrix in the destinations problems is best evaluated



by the Monte Carlo method. The proposed procedure was tested on the following practical case:  $N = 2K_0 K_1$ , number of objects detected within one observation period  $N_0 \approx 0.1N$ , number of objects detected by several scanners  $N_{(m)} \approx 0.1N$ , one scanner detecting 1-10 objects, number of scanners which detect objects during an observation period  $K_0 \approx 0.1K$ , number of new objects  $N_n \approx N$ . References 3.

### Method of First Integrals in Synthesis of Optimal Control

947K0055B St. Petersburg IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY. PRIBOROSTROYENIYE in Russian No. 4, Apr 93 (manuscript received 21 Feb 92, signed to press 24 Sep 93) pp 17-23

[Article by V.M. Lipatov, Bolshevo; UDC 519.3]

[Abstract] Synthesis of optimal control, being a dynamic problem of optimization, is solved in closed form for an autonomous control system in the general case of a nonlinear one with an additive re-entrant control vector  $dx/dt = f(x(t)) + Bu(t)$ . It is assumed that the mechanical control object  $f(x(t))$  has a vector of independent first integrals which obeys Pontryagin's principle condition and that the control vector is subject to an upper-bound constraint on its Euclidean norm. With  $x(t(0))$  and  $x(t(1))$  given in the phase space, the problem is to find the structure of operator  $u^0 = u^0(x(t))$  which will minimize the time functional  $\Phi = \int_{t(0)}^{t(1)} dt = t(1) - t(0)$  to  $\min \Phi = T^0(x(t))$ . The solution to this variational problem is sought on the basis of the characteristic optimality condition in the quick-response problem. That minimum and thus optimum value is shown to depend not only on the vector of optimal control but also on the intrinsic motion of the control object (solution to the problem) under specific initial or current conditions in phase coordinates. The characteristic optimality condition is applied to the case of an object either in intrinsic motion or at rest, with a zero Euclidean norm of the control vector and no a priori information about control of the object before time  $t_0$ . A partial differential equation of the Hamilton-Jacobi kind and the solution to its Cauchy problem with a zero boundary condition are obtained for  $T^0$ . For autonomous systems that equation is a quasi-linear first-order partial differential one solvable by the method of characteristics, the latter being solutions to a system of ordinary differential equations. In the particular case considered here the integral surface degenerates into an integral curve, the tangent plane into a tangent line, and the Monge cone into a Monge axis. As a specific example is considered motion describable by the system of two equations  $dx(1)/dt = x(2) + u(1)$  and  $dx(2)/dt = -x(1) + u(2)$  with the same upper-bound constraint on the norms of both control vectors. References 6.

### Synthesis of Magnetic System for Magnetic Resonance Imager

947K0055C St. Petersburg IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY. PRIBOROSTROYENIYE in Russian No. 4, Apr 93 (manuscript received 9 Apr 92, signed to press 24 Sep 93) pp 39-46

[Article by P.A. Galaydin, A.I. Zamyatin, and V.A. Ivanov, Institute of Precision Mechanics and Optics, Chair of Radio Apparatus Design and Manufacture, St. Petersburg; UDC 621.318.4]

[Abstract] Synthesis of an optimum magnetic system for magnetic resonance imagers is considered, namely maximizing the size of the region of a highly uniform polarizing magnetic field with the minimum number of coils having equal inside diameters and carrying currents of the same density. The conventional method of such a synthesis is expanding the magnetic induction into a Taylor series and subsequently selecting system parameters which minimize several first terms of the series so as to ensure that the deviation from field uniformity will not exceed typically the  $10^{-3}$  % order of magnitude. Regions with smaller deviation are obviously smaller. A fourth-order and thus simplest magnetic system consisting of two Helmholtz coils is inadequate for this application, because the region with an even larger ( $10^{-4}$  %) permissible deviation from field uniformity is too small. In use are now a sixth-order magnetic system of four coils (U.S. patent No 4276529, 1981), compensated solenoids with a sixth-order outside groove (Ravi Kumar and P. Chaddan in Cryogenics Vol. 27, 1987), and an eighth-order magnetic system with three circuits (FRG patent No 35 17818). Even in these systems is the region of uniform magnetic field still not large enough, unless they have a large inside diameter but then so is their weight and power requirement. A better alternative is shown to be a tenth-order magnetic system with only three equally spaced solenoids having equal inside diameters and wound with rectangular conductors, a longer one with a smaller outside diameter between two identical shorter ones with larger outside diameters along the common axis. The method of Taylor series expansion is applied here to the longitudinal component of magnetic induction at any point a distance  $z$  away from the axis of a solenoid with an inside radius  $R$  and a length  $L$ . The geometry of the central solenoid is characterized by two dimensionless parameters  $a_1, b_1$ . The two lateral solenoids are regarded as the difference between two solenoids with dimensionless geometrical parameters  $a_2, b_2$  and  $a_2, b_2$  respectively. Such a magnetic system is thus characterized by five dimensionless design parameters. With the value of  $a_1$  (or any one of the other parameters) specified, the other four are evaluated as polynomial functions of that one. This has been done numerically for  $a_1 = 1.1$ , with each of the other four parameters expressed as complete fifth-degree polynomial in  $a_1 - 1$  with a free term each. On this basis has been built a resistive MR imager with a two-loop water cooling system. The solenoids are wound with tubular rectangular conductors.

the central one having 10 layers of 72 turns and each lateral having 14 layers of 29 turns, for a nominal magnetic induction of 0.1 T and an operating current of 111 A. The inside diameter and the total length are 71 cm and 176.8 cm respectively, the larger outside diameter being 87.3 cm. The diameter of the active region with a less than  $10^{-5}$  % deviation from field uniformity is 52 cm. The imager weighs 800 kg and draws a power of 39 kW.

#### **Spatial Filtration of Holographic Lateral-Shear Interferograms**

947K0055D St. Petersburg IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian No. 4, Apr 93 (manuscript received 9 Mar 92, signed to press 24 Sep 93) pp 58-63

[Article by V.G. Gusev, Tomsk State University imeni V.V. Kuybyshev, Chair of Optoelectronic Systems and Long-Distance Sounding; UDC 778.38]

[Abstract] Formation of lateral-shear interferograms by double-exposure holography is examined and spatial filtration enhancing the interference immunity of this process is proposed, a diffusely scattered field being used for monitoring wave aberration of lenses and objects. Objects with larger focal lengths require larger-size and thus less interference-immune holographic apparatus, the purpose of spatial filtration being to overcome the resulting difficulty. In the first exposure, a matted screen the incident converging beam of coherent light has a quasi-spherical waveform with a radius of curvature equal to the distance  $d_1$  from the monitored lens  $L_1$  with a focal length  $f_1 > d_1$  and the hologram of diffusely scattered field monitoring this lens is recorded by a quasi-plane reference wave. Then, prior to the second exposure, the matted screen is shifted in its plane through a distance  $z$  along say the  $x$ -axis axis and the monitored lens is shifted in its principal ( $x_2, y_2$ ) plane in the same direction through a distance equal to  $zf_1/d_1$ .

Reconstruction of the thus recorded double-exposure hologram with a copy of the reference wave gives rise to a diffraction field whose complex amplitude is describable in the Fresnel approximation. The amplitude distribution of this field will be modified by placement of a filtering second lens with a focal length  $f_2$  in the plane of the hologram. Its new distribution indicates that the subjective speckle fields appearing as a result of two exposures will coincide in the plane in which the image of the matted screen is formed. Such double-exposure holograms were recorded experimentally with 630 nm light from a He-Ne laser on Micrat BRL photographic plates, the focal length of the first lens being varied over the 180-500 mm range and that of the second lens over the 15-30 mm range. Figures 4; references 7.

#### **New Express Method of Monitoring the Dose and Homogeneity of Ion Implantation**

947K0067B Moscow IZMERITELNAYA TEKHNIKA in Russian No. 12, Dec 93 pp 45-47

[Article by M. Ya. Lipkes, Ye. D. Martynova, V. V. Simonov; UDC 621.602]

[Abstract] This article describes a new original method of quickly monitoring the dose and homogeneity of ion implantation. It is based on the change in the properties of thin resistive films applied to the substrate surface. The films make it possible to monitor dose error and the inhomogeneity of small implant doses from  $0.01 \mu\text{C}/\text{cm}^2$ . The thickness is measured before and after exposure to the ions, and once one knows the characteristic ratio, one can easily determine the dose. Testing of several substrate points yields information on homogeneity. The film thickness after exposure can be determined through interferometry. Visual inspection can reveal inhomogeneous implantation (the tint of the resistive layer should be uniform). This new method is less labor intensive, does not require expensive equipment, and may be useful in debugging ion-beam equipment. Figures 5; references 8: 4 Russian, 4 Western.



**Noninertial Self-Focusing of Nondispersive Waves with a Broadband Spectrum**

947K0050E Moscow KVANTOVAYA ELEKTRONIKA in Russian No. 10, Oct 93 (manuscript received 12 Jul 93) pp 1028-1030

[Article by O. V. Rudenko, O. A. Sapozhnikov, Lomonosov Moscow State University; UDC 621.373.826]

[Abstract] This article studies the self-focusing of beams in a cubic-nonlinear medium without dispersion. The examination is based on a field equation similar to the nonlinear Schrodinger equation. Waves are studied with a time profile in the form of a periodic sequence of shock waves. The calculation is done in an aberrationless approximation. Cubic nonlinearity causes not only self-focusing, but also, due to the presence of shock wave fronts, the absorption of waves. However, self-focusing is insignificant: beam constriction is not accompanied by an appreciable increase in wave amplitude. Figures 2; references 11: 10 Russian, 1 Western.

**Generation of Ultrashort Pulses with Two-Component Superradiating Media**

947K0050C Moscow KVANTOVAYA ELEKTRONIKA in Russian No. 10, Oct 93 (manuscript received 12 Jul 93) pp 991-998

[Article by A. V. Andreyev, P. V. Polevoy, International Laser Center of Lomonosov Moscow State University; UDC 621.373.826]

[Abstract] The rate of spontaneous decay of an ensemble of atoms or molecules may be much higher than the rate of decay of an individual isolated atom. When it radiates, the system of atoms acts as a single unit, and collective processes, due to the interaction of atoms through a common radiation field, occur faster than relaxation processes in individual atoms. In superradiation, most of the energy stored in the system is quickly emitted in collective radiative decay. It is a coherent process, so the intensity of the superradiation pulse is proportional to the square of the number of excited atoms. This article proposes a method of substantially reducing the length and increasing the intensity of pulses of superradiation. This method is based on the introduction of a coherent resonant component into the superradiating medium. The component has a higher frequency of Rabi oscillations. The intensity of superradiation of this two-component medium may significantly increase the intensity of superradiation of each of the components separately. The pump pulse length may be several orders of magnitude larger than the generation pulse length. The parameters of the pulses that are generated may be controlled by varying the length of the active medium and the concentrations of components. A two-component medium allows one to obtain a powerful short superradiation pulse from a wide low-frequency pump pulse. The case of one-component medium is also considered. The addition of resonant absorbing atoms to a one-component medium yields superradiation pulse

parameters corresponding to instantaneous pumping in a one-component medium. Figures 7; references 10: 3 Russian, 7 Western.

**Solitons and Solitary Waves in a Nonlinear Gyrotropic Medium with Frequency Dispersion**

947K0050D Moscow KVANTOVAYA ELEKTRONIKA in Russian No. 10, Oct 93 (manuscript received 23 Apr 93) pp 1011-1015

[Article by V. A. Makarov, K. P. Petrov, Lomonosov Moscow State University; UDC 621.373.826]

[Abstract] Previously unknown accurate solutions of a system of equations for the slowly changing amplitudes of circularly polarized components of the optical field are found. New accurate solutions to pairs of linked nonlinear Schrodinger equations defining solitary waves are found. The intensity and ellipticity of these waves both depend on time. The range of parameter values of an isotropic nonlinear gyrotropic medium are found for which different types of results are possible. Their stability is numerically analyzed. Numerical modeling does not fully address the issue of stability, but one can study the dynamics of stable and unstable solutions and indicate unstable ones. Figures 2; references 6: 2 Russian, 4 Western.

**Main Results of Scientific Research Done by Institute of Radio Engineering and Electronics at Russian Academy of Sciences in 1984-92 Period: Lasers and Optical Systems (Including Fiber Optics, Methods and Devices, also Generation of Electromagnetic Signals)**

974K0056A Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol. 38 No. 10, Oct 93

[Article by Ye.N. Bazarov and K.I. Palatov]

[Abstract] During the 1984-92 period the Institute of Radio Engineering and Electronics at the Russian Academy of Sciences intensified research in the field of quantum electronics, the three main areas being: 1) fiber-optics technology, 2) laser materials and devices, 3) spectroscopy based on nuclear-magnetic resonance or on luminescence. In the first area have been for the first time developed:

- a method of extruding single-mode fibers with sheaths made of fluorine-doped quartz glass for 1.3-1.55  $\mu\text{m}$  infrared light
- a new technology for producing anisotropic single-mode fibers which maintain the polarization and the intensity of light with minimal losses,
- a laboratory technology for producing single-mode fibers which transmit 1.3  $\mu\text{m}$  light with an only 0.7 dB/km maximum loss,
- and a method of welding together different fibers with an only 0.5 dB loss per joint.

In addition to improvement of the extruding apparatus, there have been developed a plasmochemical variant of vertical lateral deposition for glass-forming oxides with use of organometallic compounds as initial reactants, a method of producing large-aperture fibers, a method of producing low-loss multimode fibers. A new method of forming anisotropic "bow tie" fibers, with the aid of thermal shields, has been proposed and demonstrated. A high magnetic susceptibility of single-mode fibers has been attained by use of using rare-earth elements as dopants. For the first time has been developed a tubeless method of lateral deposition of thin fluorosilicate sheaths on quartz rods in a microwave plasma. Jointly with the Institute of Optical Physics and the Scientific Research Institute of Electrical Systems at the Ministry of Electrical Industry have been produced radiation-resistant power fibers, radiation-resistant and mechanically strong single-mode and multimode fibers, thick fiber strands for optical cables, and large-aperture low-loss fibers doped with various rare-earth elements as well as large-aperture quartz-quartz fibers for transmitting up to 500 W of laser radiation power with 80% efficiency. Other developments include deposition of polymer sheaths, new silicon elastomers for fiber coatings which will ensure at least 99% transmission, and a cryogenic microcable for temperatures from 80°C down to -60°C. Theoretical studies have yielded a theory of microflexure and a new model of hydrolytic fracture of quartz fibers. New apparatus with fiber-optic components for measuring physical quantities and methods of doing it have also been developed, the components including fiber thermooptic channel switches, Fourier analyzers, a random-access memory, polarizers, light modulators, two-mode reflectometers, directional couplers, temperature and magnetic field transducers. Work has furthermore been done on several practical applications of fiber-optic technology. In the area of laser materials and devices there have been developed a method of hardening phosphate glass, a new Cr-Y-Er glass for heat-resistant minilasers and high-efficiency low-threshold quatrions, a 1.5  $\mu\text{m}$  Er-minilaser suitable for a record high 7 Hz pulse repetition rate, borate glass activated with Yb and Er. There also have for the first time been achieved parametric resonance emission of ultraviolet picosecond pulses and continuous high-efficiency emission by Nd ions. Other new developments include powder lasers (Nd-ion implanted in powders of La oxide or oxysulfide, binary Na, La, Ba, or Gd chromate- molybdate, La-Sr niobate, and Ga-Yb sulfide with Nd impurity), a new kind of mirrors using resonant metal screens for optically pumped lasers, a highly long-time stable  $\text{CO}_2\text{-OsO}_4$ , and diffusely reflecting coatings (aluminum, fused quartz, phosphate glass) for laser reflectors, also a new method of hardening phosphate glass for active media and a new method of welding together glasses containing chromium. The feasibility of producing fibers for high-efficiency transmission of infrared light has been proposed on the basis of theoretical analysis and then demonstrated experimentally on fibers transmitting 1.5  $\mu\text{m}$  at an average power of 2 W with an up to 30% efficiency. With low-energy ultraviolet lasers, efficient

frequency conversion by stimulated Raman scattering has been achieved in a multipass vessel containing methane under a pressure of 30 atm. Research was done on both electron-magnetic resonance and nuclear-magnetic resonance spectroscopy, studies of the latter having revealed a "cascade" narrowing of the NMR spectra owing to concurrent action of a strong radio-frequency field and slow molecular movements in solids. As to generators of electromagnetic signals, there have been developed microminiature microwave vacuum devices including solid-state oscillators such as transistors, avalanche diodes, and Gunn-effect diodes. More than 80 scientific articles have been published during that period.

#### Ad for Russian Optical Fiber Converter for TV Systems

947K0063A Moscow *TEKHNIKA KINO I TELEVIDENIYA* in Russian No. 10, Oct 93 p 66

[Advertisement: "FOD Optical Fiber Converter for Television Systems, Model 9004A/B"]

[Text] Hundreds of thousands of tv viewers are being delighted daily by the high quality of the image on the screens of their tv sets thanks to the FOD 9004 modem.

The transmission of studio-quality tv signals for dozens of kilometers without relaying even in the presence of electromagnetic or industrial interference will not be a problem for you, if you use the FOD 9004 A/B modem. As part of the "Elektronika-Svyaz" [Electronics-Communications] system, the modem provides for the reception and transmission of one tv and four sound channels of the highest quality as per GOST [state standard] 11515-75 and GOST 19463-89 over a single-mode optical cable. The possibility of relaying the signals makes it possible to expand the transmission range by thousands of kilometers.

#### Technical specifications:

Maximum coverage distance without relays: 50 kilometers.  
Signal-to-noise ratio:  $\geq 75$  dB for video,  $\geq 75$  dB for sound.  
Differential gain:  $\leq 2\%$ .  
Differential phase:  $\leq 2^\circ$ .  
Emission wavelength: Model 9004/A—1300 nm, Model 9004/B—1550 nm.  
Modulation frequency rating: 70 MHz.  
Rack dimensions: 225 mm x 2000 mm x 130 mm.  
Rack weight:  $\leq 60$  kg.  
Power supply: 24V or 220V, 50/60 Hz.

Fiber-Optic Instruments Design Bureau, a/ya [P.O. Box] 48, 129010 Moscow, telephone/fax (095) 367-36-18, 258-97-43.

ELITA Electronics Institute, a/ya 2693, 2015 Vilnius, telephone (0122) 63-35-68, fax (0122) 26-27-65.

### Shaping the Directional Pattern of a Radiating Antenna When Processing Radar Signals Against a Background of Passive Noise

947K0064A Moscow *RADIOTEKHNIKA* in Russian  
No. 8-9, Aug-Sep 93 (manuscript received  
19 Sep 91) pp 49-53

[Article by A.D. Pluzhnikov; UDC 621.396.677]

[Abstract] A study analyzed optimal (from the standpoint of detecting long-range radar targets against a background of passive noise) shaping of the directional pattern of a radiating antenna at elevated scanning speeds so as to ensure three-dimensional suppression of intensive passive noise reflected by nearby objects while at the same time maximizing signals from long-range targets during continuous or quasi-continuous sounding. The analysis established that optimizing the radiation directional pattern when using elevated speeds of scanning along an angle coordinate significantly increases the efficiency of three-dimensional passive noise suppression. The resultant gain in the signal:noise ratio is on the order of 10 dB. The analysis further established that representing the optimal excitation of an array in a form analogous to the familiar Wiener solution makes it possible to determine the intrinsic radiation directional pattern and shape an optimal directional pattern by using weighted summation, thereby making it easier to control the directional pattern. Figures 2; references 9 (Russian).

### Experimental Studies of Properties of a Channel in the 100-104 MHz Range During Transmission of Digital Radio Broadcast Programs

947K0064B Moscow *RADIOTEKHNIKA* in Russian  
No. 8-9, Aug-Sep 93 (manuscript received  
29 Jan 92) pp 64-67

[Article by A.A. Berestetskiy and A.M. Sinilnikov; UDC 621.396.677]

[Abstract] An experimental study examined the properties of a radio channel operating in the range from 100 to 104 MHz during the reception of a multifrequency signal that has been repeatedly reflected from local objects. The communication system considered was assumed to transmit a signal occupying the frequency interval  $\Delta\Phi$  and to consist of several subcarriers. The following transfer function was assumed for the channel during reception at some point S:  $H(f, S) = A(f, S)e^{j\theta(f, S)}$ , where  $f$  is an element of the set  $\Delta f$ ,  $A(f, S)$  is the modulus of the channel's transfer function at the frequency  $f$  at the point S, and  $\theta(f, S)$  is the value of the phase characteristic at the very same point. It was further assumed that the signal was received by a fixed receiver. The resultant characteristic was considered the result of the signal's passage along  $i$  independent beams that were each characterized by their own delay time  $T_i$  and by a complex transmissivity corresponding to a Rayleigh channel with time scattering. In the experiment performed, the value of the two-dimensional function  $A(f, S)$  was determined for the

frequency interval  $\Delta\Phi$  as the receiver's position was changed with the small increment  $\Delta\Sigma$ . The resultant data were used to estimate the correlation function of the modulus of the channel's transfer function with respect to the frequency and band of the channel's coherence  $\Delta F$ , which it turn made it possible to plot the probability density function for the values of the delays in individual beams. The results may serve as a basis for selecting the parameters of modulation and noise-immune coding when designing digital radio broadcast systems, as well as when constructing a software model or channel emulator. The calculated estimates of the distance correlation function may be used to obtain data about the correlation interval in time as a receiver moves at a specified speed. The results provide an estimate of the permissible duration of a multifrequency message during digital information transmission, the required depth of interleaving data with respect to both time and frequency (i.e., data sent via individual subcarriers), and the duration of the protected interval when sending signals under conditions of multipathing. Figures 4; references 8: 6 Russian, 2 Western.

### Principle of Designing Fiber-Optic Computers

947K0064C Moscow *RADIOTEKHNIKA* in Russian  
No. 8-9, Aug-Sep 93 (manuscript received  
27 Nov 91) pp 83-87

[Article by S.V. Sokolov; UDC 681.7.068:671.327.1]

[Abstract] One possible version of designing an optical computer structure that would permit virtually realtime solution of N-order linear partial differential equations with variable coefficients was evaluated. Unlike in the case of conventional finite-difference schemes, when the proposed structure is synthesized, spatial (with respect to  $y$ ) subdivision of the domain of the solution  $p(y, t)$  is eliminated, and it is digitized with the increment  $h$  selected from the condition of the necessary precision of representing  $p(y, t)$  in time. The distinctive feature of the new way of writing the starting equation is its recurrent representation in terms of the argument  $t$  together with the need to solve the N-order differential equation with respect to  $y$  at each step of such a recursion. The principle of designing the proposed device for solving partial differential equations is based on the possibility of substituting the newly written differential equation in Cauchy form for an arbitrary fixed moment  $t_j$ , which in turn makes it possible to write the solution being sought by using the method of sequential approximations. Implementing the proposed method assumes, first, the organization of a recursive process and, second, the need for three-dimensional (with respect to  $y$ ) integration of the functions at each step of the iteration. At the present time, the latter operation can only be implemented for a coherent flow based on a Fourier transform pair. For this reason a fiber-optic circuit has been proposed to approximate with the required precision the subintegral function  $f(y)$  in terms of a piecewise-constant dependence followed by summation of all preceding values of the input function at each output of the circuit. The advantages of an integrator of this type are its high precision and the fact that it permits the use of a noncoherent flow.



The device proposed to implement the recurrent procedure is designed in the form of a ring. When compared with existing optical processor circuits, the proposed computer provides a higher precision of calculation and permits real-time solution of N-order linear partial differential equations given coefficients  $a_i$  that depend on  $y$ . The use of a Fourier transform and spatial-frequency filters in such cases does not permit solution of the said problem. References 3 (Russian).

#### Some Aspects of the Problem of Creating Microwave Equipment for Functional Damage

947K0067A Moscow ZARUBEZHNYAYA  
RADIOELEKTRONIKA in Russian No. 10, 11, 12,  
Oct 93-Dec 93 pp 3-10

[Article by V. V. Panov, A. P. Sarkisyan; UDC 621.391.82]

[Abstract] The scientific and technical groundwork has been laid for the development of a fundamentally new form of electronic warfare: functional damage of electronic equipment with superstrong microwave radiation. The advantages of functional equipment damage make it an effective component of a comprehensive warfare system with high-current weapons. This method may also be of interest as a part of a global system to prevent aggression. It is attractive because it does not harm personnel or the environment as it accomplishes its mission. Development of this equipment has stimulated research on the protection of electronic equipment from superstrong electromagnetic fields. Damaging microwave radiation may be produced with strong electromagnetic pulse generators or relativistic microwave radiation generators. The advantages and drawbacks of each are discussed. Linear induction electron accelerators, superhigh-powered microwave generators, relativistic microwave generators with a virtual cathode, relativistic magnetrons, and relativistic microwave devices with high-dimensional electrodynamic structures are discussed in detail. Figures 7; tables 2; references 18: 2 Russian, 16 Western.

#### Ge-Ge<sub>1-x</sub>Si<sub>x</sub> Superlattices Obtained with the Hydride Technique

947K0069A St. Petersburg FIZIKA I TEKHNIKA  
POLUPROVODNIKOV in Russian Vol. 27 No. 10,  
Oct 93 (manuscript received 13 Nov 92) pp 1591-1598

[Article by O. A. Kuznetsov, L. K. Orlov, Yu. N. Drozdov, V. M. Vorotyntsev, M. G. Milvidskiy, V. I. Vdovin, K. Karles, G. Landa]

[Abstract] The first electron microscope photographs are presented of the cross section of a stressed Ge-Ge<sub>1-x</sub>Si<sub>x</sub> superlattice obtained using the hydride epitaxy method at normal pressure in a reactor. The distribution of defects which eliminate the elastic effect of the Ge substrate on the periodic structure is shown. The X-ray diffraction method is used to track the dependence of elastic accommodation in heterolayers on their composition and thickness. Elastic deformations in the superlattice layers were studied with

combined light scattering and electric light reflection from the surface of the semiconductor. Individual layers more than 5 nm thick were studied, as well as oblique cross sections of the heterostructures. Elastic stresses in the surface layers of the superlattice have a substantial effect on the electric reflection spectrum of visible light, which leads to a shift and splitting of spectral lines. The high quality of the superlattices enables observation of doublets in combination light scattering spectra, which is also the first instance of this event. Figures 6; references 10: 6 Russian, 4 Western.

#### Magnetic Phonon Resonance and IR Lattice Reflection in p-ZnSb

947K0069B St. Petersburg FIZIKA I TEKHNIKA  
POLUPROVODNIKOV in Russian Vol. 27 No. 10,  
Oct 93 (manuscript received 29 Mar 93) pp 1631-1638

[Article by D. V. Smirnov, D. V. Mashovets, M. O. Safonchik, Yu. V. Roznovan, Zh. Leoten, V. Knapp]

[Abstract] Parallel studies were conducted of magnetic phonon resonance and the IR reflection spectra in p-ZnSb single crystals ( $p \approx 1.5 \times 10^{16-3.0 \times 10^{16}} \text{ cm}^{-3}$ ). Magnetic phonon oscillations were observed in longitudinal and transverse magnetic resistance and in the Hall effect for various orientations of the magnetic field  $H$  relative to the axes of the crystal, with fields  $H \leq \text{kOe}$  at 55-160K. When  $H \leq 100$ ,  $H \leq 001$ , the current carriers effectively interact with two (at  $H \leq 010$ ), three) modes of transverse optical phonons. Strong attenuation of the oscillation series and nonrigorous satisfaction of the conditions of a strong field leads to a shift in the maxima of transverse magnetoresistance relative to the resonance positions. comparison of the phonon frequencies determined from optical and transport data revealed the modes which most effectively interact with charge carriers. Anisotropy of magnetic phonon resonance is found to be due to the anisotropy of the effective mass, and not the phonon spectrum. When these results are compared with results obtained at 7K and at 1.4-4.2K, it is found that there is no noticeable change in the width of the forbidden zone of ZnSb at 1.4-160K. Figures 6; tables 3; references 9: 4 Russian, 5 Western.

#### Features of the Current Dependence of the Effectiveness of Spontaneous Radiation of Single Quantum Well Laser Diodes on AlGaAs/GaAs

947K0069C St. Petersburg FIZIKA I TEKHNIKA  
POLUPROVODNIKOV in Russian Vol. 27 No. 10,  
Oct 93 (manuscript received 14 May 93) pp 1713-1719

[Article by D. Z. Garbuzov, A. B. Gulakov, I. V. Kochnev, Yu. M. Shernyakov, V. B. Khalfin, B. S. Yavich]

[Abstract] Results are presented from studies of the dependence of the effectiveness of spontaneous radiation of the active region and barrier layers on current density in quantum-dimensional laser diodes on AlGaAs/GaAs. The main reasons for an increase in the threshold current density and a decrease in the differential effectiveness in laser diodes with large output losses

are an increase in the proportion of nonequilibrium carriers recombining in waveguide layers and the leaking of electrons into the p-emitter. Calculations show that at current densities  $\geq 10^4$  A/cm<sup>2</sup> the main mechanism limiting the effectiveness of injection into the quantum well is electron leakage into the p-emitter. Figures 5; references 9: 4 Russian, 5 Western.

#### Heteroepitaxial Passivation of a GaAs Surface

947K0069D St. Petersburg FIZIKA I TEKHNIKA  
POLUPROVODNIKOV in Russian Vol. 27 No. 10,  
Oct 93 (manuscript received 24 May 93) pp 1736-1742

[Article by I. A. Karpovich, B. I. Bednyy, N. V. Baydus, L. M. Batukova, B. N. Zvonkov, M. V. Stepikhova, Lobachevskiy Nizhegorod State University, Nizhny Novgorod]

[Abstract] The application of a thin ( $\approx 150$  Angstroms) coat of  $\text{In}_{0.5}\text{Ga}_{0.5}\text{P}$  on a GaAs layer passivates its surface. Such surfaces exhibit a significant decrease in the

density of surface states and bending zones (indicating a decrease in the effective density of acceptor surface states near the conductivity zone of the GaAs), as well as an increase in the intensity of edge photoluminescence and photomagnetic current. The anomalous field component is suppressed. Passivation is due to the formation of nearly perfect heteroboundaries and limiting of recombination fluxes of carriers on the surface of the heterolayer by a barrier. Surface potential was studied with the dynamic capacitor method; surface electron capture was studied with the small signal field effect method; recombination activity of the surface was studied with the photomagnetic effect and photoluminescence effect methods. Surface recombination is discussed in detail. When the thickness of the InGaP coating is reduced to 100 Angstroms the passivation effect is not manifested in the recombination characteristics of the surface, but it is retained in phenomena associated with surface adhesion. Figures 5; references 17: 5 Russian, 12 Western.

## AVIATION AND SPACE TECHNOLOGY

### Main Stages, Current State, and Prospects for the Development of Electric Discharge Machining

947F0073A Kishinev ELEKTRONNAYA OBRABOTKA MATERIALOV in Russian No. 1, 1994 (manuscript received 3 Jun 93) pp 7-11

[Article by B. I. Stavitskiy, Istok GNPP [expansion not given], Moscow]

[Abstract] Achievements and problems to be overcome in the development of electric discharge machining are described. At present Istok has manufactured dozens of machining tools that manufacture parts with a wire electrode 0.01-0.30 mm in diameter. No other machine tools can reach the 0.01 mm level. A surface roughness of no greater than 1.25  $\mu\text{m}$  can be obtained. The machines save space, time, energy, labor, money, and materials. Under development are electric discharge machining tools with programmable control using 32-bit microprocessors (80386DX with a 80387DX coprocessor). The machines are equipped with hard disks and two 3.5 floppy disk drives (1 megabyte each). The new machines use high-speed transistors and can form microsecond and nanosecond pulses. Six to eight axes may be controlled simultaneously. The carriage can be moved 1.4-3 m/min. Thermal deformation problems are avoided. Rough machining is done in water with high-precision final processing with oil. Surface roughness is reduced to 0.5  $\mu\text{m}$  with special bipolar nanosecond pulses with a megahertz recurrence frequency. The machines have up to 10 megabytes of memory. Further improvements are possible by increasing performance and precision, using microprocessors to continuously monitor, analyze, and control the machining process. The process of electric discharge machining itself may be further studied, and the pulse generation system may be improved.

### Electro-erosion Processing of Special Purpose Parts and Their Conversion

947F0073B Kishinev ELEKTRONNAYA OBRABOTKA MATERIALOV in Russian No. 1, 1994 (manuscript received 3 Jun 93) pp 25-26

[Article by V. V. Bulavkin, V. Kh. Postanogov, Tekhnomash Scientific Production Association, Moscow]

[Abstract] Electro-erosion processing (electric discharge machining) was heavily used by the Soviet aerospace industry for high-strength, high-temperature, viscous materials. Now, as demand declines, efforts are being made to apply this technology to civilian industry. One problem is that this technology was designed for small-lot production. Unique examples are presented of successful application of electroerosion processing in machine building: monolithic turbine disks, compound section structures of stainless steel and titanium alloys,

waveguide channels, and honeycomb structures. Electro-erosion processing is being widely used in machine building to manufacture blade wheels, bushings, membranes, rotors, vibrators, cutting dies, chucks, templates, etc.

### Study of the Development of Turbulence in the Region of a Break Above a Triangular Wing

947F0083 Novosibirsk SIBIRSKIY FIZIKO TEKHNIЧЕСКИЙ ЖУРНАЛ in Russian No. 6, 1993 (manuscript received 28 Jul 93) pp 22-25

[Article by S. P. Bardakhanov, A. V. Keyno, V. V. Kozlov, Institute of Theoretical and Applied Mechanics, Siberian Division, Russian Academy of Sciences, Novosibirsk; UDC 532.526]

[Abstract] This paper clarifies the picture of the flow around triangular wings with a large sweepback at large attack angles. Experiments were conducted at subsonic speeds. Artificial turbulence was induced. Secondary eddy structures were formed which are similar to Taylor eddies between coaxial rotating cylinders. These structures lead to a laminar-turbulent transition. Creation of turbulence in the eddy may occur without altering the profile of the average speed, that is, without eddy decay. Figures 3; references 6: 4 Russian. 2 Western.

### Electroerosion Machining in Aviation Engine Construction

947F0085 Kishinev ELEKTRONNAYA OBRABOTKA MATERIALOV in Russian No. 6, 1993 (manuscript received 17 May 93) pp 18-21

[Article by V. I. Polyanin, A. K. Altynbayev, B. Ye. Karasev, Scientific Research Institute of Engines]

[Abstract] This paper examines the use of electroerosion machining (electric discharge machining, EDM) on current-carrying materials (copying and piercing operations). Conclusions reached from experience using EDM are expressed. Methods of improving EDM equipment are outlined, and include: increasing the range of pulse characteristics, better monitoring of the machining process, more flexible control, specialized machinery, new materials, special liquids for the machining process, and expert systems to design procedures. Flexible modules for piercing operations are described in detail. Current equipment achieves an accuracy of 0.01 mm. A number of machines in the SEP series have been developed for EDM. In one pass the machines can make up to 15,000 perforations; depending on the number and diameter of the holes this can take 30-70 minutes. The SEL-1 is a specialized machine tool with a semi-automatic mode, and it is described. It has two independent heads and machines the channels between the blade of monorotors. The accuracy achieved is 0.05 mm; the roughness ratio is 2.5. References 3 (Western).



## NUCLEAR AND NON-NUCLEAR ENERGY

### Gosatomnadzor Order Confirming Statute

944E0656B Moscow ROSSIYSKIYE VESTI in Russian  
29 Mar 94 p 5

[Order of 3 March 1994 confirming Statute on Civilian Nuclear Power Plant Construction]

[Text]

#### Order

Moscow, 9 March 1994, No 26

**Approval of the Statute on the Procedure for Issuing Provisional Permits from Russian Gosatomnadzor for Construction of Nuclear Power Plant Units for Civilian Purposes**

I order:

That the attached guideline document, "Statute on the Procedure for Issuing Provisional Permits from Russian Gosatomnadzor for Construction of Nuclear Power Plant Units for Civilian Purposes" (RD-04-07-94) be approved.

[Signed] A.T. Gutsalov, first deputy chairman of Russian Gosatomnadzor

### Statute on Civilian Nuclear Power Station Construction

944E0656A Moscow ROSSIYSKIYE VESTI in Russian  
29 Mar 94 pp 5-6

[Statute on The Procedure for Issuing Provisional Permits from Russian Gosatomnadzor for Construction of Nuclear Power Plant Units for Civilian Purposes; registered in the RF Ministry of Justice on 21 March 1994, Reg. No 523; approved by Order No 26 of 9 March 1994 RD-04-07-94]

[Text]

#### 1. General Regulations

- 1.1. The issuing of provisional permits for the construction of nuclear power plant (AS) units for civilian purposes in the Russian Federation is carried out by Russian Gosatomnadzor [Federal Oversight of Nuclear and Radiation Safety] on the basis of the Statute on Russian Gosatomnadzor, approved by order of the President of the Russian Federation on 5 June 1992 No 283-rp, with amendments approved by order of the President of the Russian Federation of 16 September 1993, No 636-rp.

- 1.2. This Statute on the procedure for issuing provisional permits from Russian Gosatomnadzor for construction of nuclear power plant units for civilian purposes (henceforth called the Statute) establishes the procedure for obtaining and accompanying a provisional permit for construction of AS units and is in force during the transitional period until the Statute on the procedure for issuing licenses for the construction of nuclear power plants goes into effect.

- 1.3. The statute applies to the construction of AS units on Russian Federation territory.

- 1.4. The provisional permit of Russian Gosatomnadzor for the construction of an AS unit is an official document, which:
  - permits the construction of a specific AS unit;
  - establishes the conditions under which the construction of the unit is permitted.

- 1.5. A provisional permit for construction is issued by Russian Gosatomnadzor individually for each AS unit.

- 1.6. This Statute also applies to facilities (RAO, KhOYaT [chemical weapons and nuclear equipment] and other storages), the construction of which on the territory of existing AS is carried out according to individual itemized lists.

- 1.7. The issue of a provisional permit for construction of AS units begun before this Statute was introduced is based on:
  - the fact of acknowledgement by Russian Gosatomnadzor of earlier issued documents permitting construction of AS units;
  - carrying out an evaluation of the safety of an AS unit, including the conditions of its location, on the basis of an examination of the documents submitted to justify the application;
  - making the necessary inspections;
  - establishing the conditions for the functioning of the provisional permit.

- 1.8. This Statute applies to the period up to completing the construction and putting into operation the basic facilities (in accordance with the itemized list) and establishes the following stages in the procedure for obtaining a provisional permit for construction of a nuclear power plant unit:
  - issue of a preliminary decision on the site for construction of the AS unit;
  - issue of a provisional permit for construction of the AS unit.

The stage of issuing the preliminary decision on the site applies only to sites for the AS units intended for construction.

- 1.9. A provisional permit for construction of an AS unit will be issued to an enterprise to which federal property of the AS has been transferred (or will be transferred in accordance with a contract with an investor) for full economic jurisdiction (henceforth called the Enterprise) and which was founded in accordance with the RSFSR Law "On Enterprises and Entrepreneurial Activity" and, if the Enterprise:
  - adheres to the principles, criteria and requirements for nuclear and radiation safety which, on the basis of its competence, Russian Gosatomnadzor establishes by means of rules and norms, decrees, management and the conditions of the provisional permit for construction;
  - presents Russian Gosatomnadzor with information pertaining to all aspects of constructing the AS unit, in the amount and in the period established by Russian Gosatomnadzor;
  - fulfills the "Requirements for Operational Organization of a Nuclear Power Plant" (RD-04-03-93), approved by Russian Gosatomnadzor on 26 May 1993.
- 1.10. A provisional permit for construction of an AS unit is in effect throughout the period of its force, unless Russian Gosatomnadzor suspends or discontinues the force of the provisional permit.
- 1.11. If the Enterprise is liquidated or reorganized, the provisional permit for construction of an AS unit ceases to be in force.
- 2. Procedure for Obtaining a Preliminary Decision on the Site for Construction of an AS Unit**
- 2.1. The preliminary decision on the site, issued to the Enterprise according to the results of an examination of the materials substantiating the application, is an official document of Russian Gosatomnadzor on the suitability in principle of the site for construction of the AS.
- 2.2. To obtain the preliminary decision on the site for construction of the AS unit, the Enterprise submits to Russian Gosatomnadzor, addressed to the chairman, an application in five copies (the number of copies of individual documents may be more precisely defined by Russian Gosatomnadzor), including:
  - a pro forma statement, presented as Appendix No 1;
  - a copy of the document verifying the state registration of the Enterprise;
  - a copy of the Enterprise charter;
  - a copy of the document on the designation of the Enterprise by the higher state administrative body, responsible for carrying out the activity at all stages of the AS life cycle;
  - a set of documents substantiating the application in accordance with Appendix No 2;
  - an obligation (letter of guarantee), confirming the existence of financial potentials and readiness to pay the expenditures for carrying out expert examinations of the documents substantiating the application;
  - a copy of the act of preliminary agreement on the location of the AS unit, without withdrawal of the land parcel.
- 2.3. All the technical documents should be filled out in accordance with the requirements for normative-technical documents on nuclear and radiation safety. Copies of the documents should be certified by the signature of the director of the Enterprise and the seal of the Enterprise.
- 2.4. Having arrived at Russian Gosatomnadzor, the application is registered in the Business Administration office in accordance with the established procedure and is sent to the Administration for Organization of Licensing Procedures and Coordination of Regional Bodies.
- 2.5. The Administration for Organization of Licensing Procedures and Coordination of Regional Bodies organizes and implements verification of the application materials and adherence to the rules for making them out, and determines the conformance of the composition of the documents submitted to the requirements of the existing guideline documents of Russian Gosatomnadzor.

Verification of the application lasts up to 15 days from the time it arrives.

According to the results of the verification, a decision is made on accepting the application for examination or on its refusal for examination, which is signed by the chief of the Administration for Organization of Licensing Procedure and Coordination of Regional Bodies.

The Enterprise is notified of the results of the verification of the application no later than five days after the decision is formulated.
- 2.6. Notifications sent upon refusal of an application indicate the reason for the refusal.

The application may be refused examination if the documents of the application fail to meet the requirements for their composition and formulation.

When the results of the verification of the application documents are favorable, it is turned over to the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants.

- 2.7. The Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants organizes the examination of the documents of the application and prepares a schedule for their examination, which is officially signed by the chiefs of the administrations commissioned to examine the documents of the application, and approved by the first deputy chairman of Russian Gosatomnadzor.

The period for studying the materials of the application and preparing the schedule is up to 20 days.

The documents substantiating the application are turned over to the Administration for Organizing the Expert Examination on Safety, for organization of the expert examination.

- 2.8. The Administration for Organization of Expert Examination on Safety may draw in, on a contractual basis, outside organizations and individual experts to make the expert examination, establishes the requirements for the expert decision, determines the staff of participants in the expert examination, issues the technical assignments to the experts and carries on business correspondence with them. The Administration for Organization of Expert Examination on Safety, through the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants, interacts with the Enterprise when the expert examination is made (obtaining additional substantiating materials and written explanations, holding discussions, etc.).

- 2.9. On the basis of the experts' decisions, including those obtained from the Petitioner, the Administration for Organization of the Expert Examination on Safety prepares the consolidated decision on the results of the expert examination.

The consolidated decision is signed by the chief of the Administration for Organization of Expert Examinations on Safety and sent to the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants.

- 2.10. On the basis of examination of the set of documents substantiating the application, the consolidated decision based on the results of making the expert examination and the results of inspections carried out if necessary, including of the site intended for construction, the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants prepares the preliminary decision on the site for construction of the AS, which is signed by the chairman of Russian Gosatomnadzor or his first deputy.

The preliminary decision is filled in on the blank form prescribed. The requirements for the form and the contents are given in Appendix No 3. The Administration for Organization of Licensing Procedures and Coordination of Regional Bodies carries out the recording, registration and distribution of the preliminary decision.

- 2.11. Interaction with other state administrative organs and regional organs of authority on problems of the preliminary decision of Russian Gosatomnadzor on the site for construction of the AS is carried out by the Administration for Organization of Licensing Procedures and Coordination of Regional Bodies.
- 2.12. Disputable questions arising with respect to the preliminary decision on the site for construction of the AS unit are examined by the first deputy chairman of Russian Gosatomnadzor.

### 3. The Procedure for Issuing a Provisional Permit for Construction of an AS Unit

- 3.1. The Enterprise may begin construction work on buildings and structures of the AS unit at the site of the AS only after a provisional permit for construction of the AS unit is obtained at Russian Gosatomnadzor (for AS units being newly built).

- 3.2. To obtain a provisional permit for construction of an AS unit, the Enterprise submits an application to Russian Gosatomnadzor, addressed to the chairman, in five copies (the number of copies of individual documents may be precisely defined by Russian Gosatomnadzor), including:

- an application using the form given in Appendix No 4;
- a copy of the document certifying state registration of the Enterprise which has submitted the application;
- a copy of the Enterprise charter;
- a copy of the document on the designation of the Enterprise by a higher state administrative body as responsible for carrying out the activity at all stages of the vital cycle of the AS;
- a copy of the document on withdrawing the land and transferring it for carrying out preliminary construction work for a nuclear power plant and on protecting the territory of the location;
- a copy of the contract with the investor, confirming the right of the Enterprise to full economic authority over the property of the AS unit constructed;
- an obligation (letter of guarantee), confirming the existence of financial potentials and readiness to pay for the expenditures to carry out an expert examination of the documents substantiating the application;
- a set of documents substantiating the application, in accordance with Appendix No 5.

3.3. All the technical documents should be filled out in accordance with the requirements of normative-technical documents on nuclear and radiation safety. Copies of the documents should be certified by the signature of the director of the Enterprise and the seal of the Enterprise.

3.4. Having arrived at Russian Gosatomnadzor, the application is registered at the office of Business Administration in accordance with the established procedure and sent to the Administration for Organization of Licensing Procedures and Coordination of Regional Bodies.

3.5. The Administration for Organization of Licensing Procedures and Coordination of Regional Bodies organizes and implements verification of the application materials and adherence to the rules for making them out, and determines the conformance of the composition of the documents submitted to the requirements of the existing guideline documents of Russian Gosatomnadzor.

The verification lasts not more than 15 days from the time the application is received.

According to the results of the verification, a decision is made on accepting the application for examination or on refusing it examination, and this is signed by the chief of the Administration for Organization of Licensing Procedures and Coordination of Regional Bodies.

The Enterprise is informed of the results of the verification no later than five days after the decision is formulated.

3.6. Notifications sent upon refusal of an application indicate the reason for the refusal.

The application may be refused examination if the documents of the application fail to meet the requirements for their composition and formulation.

If the results of the documents of the application are favorable, it is turned over to the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants.

3.7. If the results of the verification of the materials of the application are favorable, the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants organizes an examination of the materials of the application and prepares a schedule for examining the materials of the application, which is officially signed by the chiefs of the administrations taking part in the examination of the materials of the application, and is approved by the first deputy chairman of Russian Gosatomnadzor.

The period for studying the materials of the application and preparing the schedule is one month.

The documents substantiating the application are turned over to the Administration for Organizing the Expert Examination on Safety, for organization of the expert examination.

3.8. The Administration for Organization of Expert Examination on Safety may draw in, on a contractual basis, outside organizations and individual experts to make the expert examination, establishes the requirements for the expert decision, determines the staff of participants in the expert examination, issues the technical assignments to the experts and carries on business correspondence with them. The Administration for Organization of Expert Examination on Safety, through the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants, interacts with the Enterprise when the expert examination is made (obtaining additional substantiating materials and written explanations, holding discussions, etc.).

The NTTs [Scientific-Technical Center] of the YaRB [Nuclear and Radiation Bureau] evaluates the scientific grounds of the materials substantiating the application which are being examined by the experts.

3.9. If necessary, Russian Gosatomnadzor may require the Enterprise to submit additional information, further develop the substantiating materials in order to remove comments and shortcomings revealed in the process of examination, and to rework individual technical designs for nuclear and radiation safety, if they are recognized as unsatisfactory.

3.10. According to the materials of the expert decisions, including those obtained from the Enterprise, the Administration for Organization of Expert Examination on Safety prepares a consolidated decision on the results of the expert examination and appendices in accordance with the conditions for the provisional permit for construction of the AS unit to be in force.

The collated decision is signed by the chief of the Administration for Organization of Expert Examination on Safety and sent to the Administration for Oversight of Nuclear and Radiation Safety for Nuclear Power Plants.

3.11. In the process of examining the application, Russian Gosatomnadzor may make an inspection on its own decision.

3.12. When preparing the decision on the possibility of issuing a provisional permit for construction of an AS unit, Russian Gosatomnadzor takes into consideration the decisions of organs of state administration, regulation and oversight, which have been obtained by the Enterprise concerning the plan for the AS unit being built or slated for construction.



- 3.13. According to the results of the examination of the set of documents substantiating the application, the consolidated decision based on the results of making the expert examination and the results of the inspections, the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants formulates a preliminary decision of Russian Gosatomnadzor on the application to obtain a provisional permit for construction of the AS unit and formulates the conditions for the permit to be in force.

The preliminary decision is signed by the chief of the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants and approved by the chairman or first deputy chairman of Russian Gosatomnadzor.

- 3.14. In a period of not over five days after the date of approval of the preliminary decision, Russian Gosatomnadzor publishes, in a generally accessible publication, a report on the completion of the examination of the set of documents substantiating the application and on the possibility of offering interested parties the preliminary decision for familiarization, as well as information from the set of documents substantiating the application, with the exception of information which constitutes a state secret, in accordance with Russian Federation legislation.
- 3.15. Interaction with interested parties is carried out by the Administration for Organization of Licensing Procedures and Coordination of Regional Bodies, responsible for this procedure.
- 3.16. When new aspects pertaining to the ensurance of safety are revealed as the result of the participation of interested parties, the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants organizes additional study of the materials of the application and may demand from the Enterprise additional documents and substantiations, necessary in this connection.
- 3.17. The Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants prepares the final decision on the application and the draft of the provisional permit for construction, including the conditions for its force.
- 3.18. The chairman of Russian Gosatomnadzor or his first deputy makes the final decision on issuing or refusing to issue the permit on the basis of the preliminary decision of Russian Gosatomnadzor and in consideration of the results of a study of the materials obtained at the stage of participation of interested parties.
- 3.19. The permit is filled out on the prescribed blank form, given in Appendix No 6, and is signed by the chairman of Russian Gosatomnadzor or his first deputy. When the decision has been made, the Enterprise is informed by the Administration for

Organization of Licensing Procedures and Coordination of Regional Bodies, no later than five days from the date of the decision.

- 3.20. The Administration for Organization of Licensing Procedures and Coordination of Regional Bodies carries out the recording, registration and distribution of the provisional permit for construction.
- 3.21. The provisional permit begins to be in force from the date of its registration.
- 3.22. The provisional permit includes the conditions for its being in force, which are an integral part of it. A sample list of the basic requirements subject to inclusion in the conditions for force of the provisional permit for construction of a nuclear power plant unit is given in Appendix No 7.
- The conditions are signed by the chief of the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants.
- 3.23. The period of force of the provisional permit is established for the entire construction period of the unit of the nuclear power plant applied for.
- 3.24. The responsibility of the Enterprise for the activity of constructing the AS unit begins from the time the provisional permit is issued.
- 3.25. Disputable questions arising during the examination of the materials of the application and formulations of the conditions for the provisional permit for construction of an AS unit are examined by the first deputy chairman of Russian Gosatomnadzor.
- 3.26. Complaints to the bodies of Russian Gosatomnadzor carrying out the examination of the application to obtain a provisional permit for construction of an AS unit are turned over by the Enterprise to the first deputy chairman of Russian Gosatomnadzor.

Russian Gosatomnadzor informs the Enterprise of the results of examination of a complaint no later than 20 days from the date of its receipt.

- 3.27. The provisional permit for construction of an AS unit is made up in four (five) copies and is kept (one copy each):
- at the Administration for Organization of Licensing Procedures and Coordination of Regional Bodies;
  - at the Administration for Oversight of Nuclear and Radiation Safety of Nuclear Power Plants;
  - at the Regional District Administration of Russian Gosatomnadzor, which carries out state oversight of the construction of the given AS unit;
  - at the Enterprise management;
  - at the AS Administration (if it exists).

The provisional permit is kept in the "Permanent Storage" file.

- 3.28. Refusal to issue a provisional permit for construction occurs when, on the basis of an analysis of the documents substantiating the application and the results of the inspection, the conclusion is drawn that the conditions necessary to ensure the safety of the AS unit are absent or inadequate.
- 3.29. Refusal to issue a provisional permit for construction of an AS unit signifies prohibition of construction of the AS unit.
- 3.30. If the Enterprise violates the conditions for force of the provisional permit, Russian Gosatomnadzor may suspend the force of the provisional permit until the violations revealed are eliminated or may discontinue the force of the provisional permit.

#### **4. Issuing Permits During the Period of Constructing an AS Unit**

- 4.1. During the period of construction of an AS unit, the organization (enterprise) carrying out the construction activity, upon representation of the Enterprise (operating organization) should obtain a permit for individual types of activity and stages of fulfilling the work specified by the guideline documents of Russian Gosatomnadzor which are in force, and being carried out during the construction, including a permit:
- for the right to perform construction-installation work at structures important for safety;
  - for the right to install equipment and pipelines important for safety;
  - for the right to install systems to control and protect automated technological process control systems;
  - for the right to construct the airtight casing of the AS;
  - for the right to install systems for reliable electric power supply;
  - for the right to perform adjustment work, including testing in the cold state and testing the protective casing.
- 4.2. In the period of construction, the permits indicated in paragraph 4.1 may be obtained only after the provisional permit from Russian Gosatomnadzor for construction of the AS unit has been obtained.
- 4.3. For AS units under construction, the attitude of Russian Gosatomnadzor toward permits for individual types of activity in the period of construction, issued before a decision is made on issuing the provisional permit for construction of an AS unit, is reflected in the conditions for the provisional permit to be in force.

- 4.4. Permits for individual types of activity in the period of AS construction are issued by the District Administration of Russian Gosatomnadzor, which oversees construction of the AS unit in accordance with the guideline documents in force.

#### **5. Accompaniment for a Provisional Permit for Construction of an AS Unit and Correction of the Conditions for Its Force**

- 5.1. The accompaniment for the provisional permit for construction of the AS unit includes carrying out state oversight of the Enterprise's adherence to the conditions for the provisional permit to be in force, safety rules and norms and the application of sanctions if they are not fulfilled, and is carried out in accordance with the guideline documents of Russian Gosatomnadzor that are in force.
- 5.2. The accompaniment for the provisional permit for construction of an AS unit is carried out by the Administration for Oversight of Nuclear and Radiation Safety and the regional agency of Russian Gosatomnadzor, indicated on the provisional permit.
- 5.3. Russian Gosatomnadzor establishes the number and frequency of inspections as the accompaniment for the provisional permit for construction of an AS unit in accordance with the guideline documents of Russian Gosatomnadzor that are in force.
- 5.4. Correction of the conditions for the provisional permit for construction of an AS unit to be in force.
- 5.4.1. Correction of the conditions for the provisional permit for construction of an AS unit to be in force is made when there are changes in the materials for substantiation of safety, the composition of equipment important for safety, etc.
- 5.4.2. Correction of the conditions is carried out on the initiative of the Enterprise or at the request of Russian Gosatomnadzor.
- 5.4.3. The possibility of introducing corrected conditions is provided for:
- through their examination in accordance with the procedure established for obtaining the initial provisional permit;
- in accordance with unilateral procedure based on written notification, signed by the first deputy chairman of Russian Gosatomnadzor.

[Registered] Scientific-Technical Administration of Russian Gosatomnadzor  
11 March 1994, No 92-94



Documents—Russian Federal Oversight of Nuclear and Radiation Safety (Gosatomnadzor)

**Appendix No 1**  
(on blank form  
of Enterprise)

To the Chairman of Russian Gosatomnadzor

109147, Moskva, ul. Taganskaya, 34

**APPLICATION**

**To Obtain Preliminary Decision on Site for Construction of an AS Unit**

Please issue

full name of Enterprise

legal address, bank requisites

preliminary decision on site for construction

unit number, type of reactor unit, power (MW)

name of nuclear power plant, location

Documents to substantiate application to obtain preliminary decision on site for construction of \_\_\_\_\_ unit of \_\_\_\_\_ nuclear power plant in accordance with the requirement of the "Statute on Procedure for Issuing Provisional Permits from Russian Gosatomnadzor for Construction of Nuclear Power Plant Units for Civilian Purposes" are enclosed.

Enclosure: Composition of set of documents,  
number of items,  
number of sheets.

Director of enterprise

signature (last name, first name, patronymic)

M.P

" \_ " \_ 199 \_

**Appendix No 2**

**Set of Documents Substantiating Application to Obtain Preliminary  
Decision on Site for Construction of an AS Unit**

1. Materials to substantiate safety of nuclear power plant\*
2. General program to ensure quality -- POKAS(O)
3. Program to ensure quality when selecting site -- POKAS(VP)
4. Materials of TEO [technical-economic substantiation] as part of substantiation for locating AS on site.

*\* Materials to substantiate safety are drawn up in consideration of the "Requirements for the Content of the Report in Substantiation of the Safety of Nuclear Power Plants," approved by Russian Gosatomnadzor as part of the "Preliminary Report in Substantiation of the Safety of AS," which contains all the required normative-technical documents in force to substantiate the selected site, covering the safety-related aspects, and a conceptual description of the AS and its safety for the environment and the population, including a preliminary analysis of the safety.*

**Appendix No 3****Russian Federal Oversight of Nuclear and Radiation Safety****Preliminary Decision on Site for Construction of  
Nuclear Power Plant Unit**

No \_\_\_\_\_

Issued "\_\_\_" \_\_\_\_ 199\_\_

Name of Enterprise:

Name of nuclear power plant:

Russian Gosatomadzor, having examined the adherence to and substantiation of the criteria presented for the location of nuclear power plants, gives a preliminary decision on the site \_\_\_\_\_

\_\_\_\_\_  
(Precise indication of the location of the site)\_\_\_\_\_  
(full name of the Enterprise)

Legal address \_\_\_\_\_

The site is suitable (unsuitable) for further carrying out of design-survey work for \_\_\_\_\_ unit with reactor type \_\_\_\_\_ power \_\_\_\_\_ MW of the \_\_\_\_\_ nuclear power plant.

Reason: application No \_\_\_\_\_ of \_\_\_\_\_ 199

Appendix: Consolidated decision according to results of expert examination.

Chairman of Russian Gosatomadzor

(last name, first name, patronymic)

**Appendix No 4**  
(on blank form  
of Enterprise)

**APPLICATION**  
**To Obtain Provisional Permit for Construction of**  
**a Nuclear Power Plant Unit**

To the Chairman of Russian Gosatomnadzor

109147, Moskva, ul. Taganskaya, 34

full name of Enterprise

legal address, bank requisites

intends to carry out (is carrying out) construction

number of unit, type of reactor unit, power (MW)

name of nuclear power plant, location

Please issue a provisional permit for construction of a unit with a  
reactor unit \_\_\_\_\_ with a power of \_\_\_\_\_ MW of  
the \_\_\_\_\_ nuclear power plant \_\_\_\_\_  
(location)

Documents to substantiate application to obtain a provisional permit for  
construction of \_\_\_\_\_ unit \_\_\_\_\_ of a nuclear power plant are  
in accordance with the requirement of the "Statute on the Procedure for  
Issuing Provisional Permits from Russian Gosatomnadzor for Construction  
of Nuclear Power Plant Units for Civilian Purposes."

Appendix: Composition of set of documents,  
number of items,  
number of sheets.

Director of enterprise

M.P

signature (last name, first name, patronymic)  
" " 199



**Appendix No 5****SET OF DOCUMENTS  
Substantiating Application to Obtain Provisional  
Permit for Construction of a Nuclear Power Plant Unit****A. For newly presented designs of AS units:**

1. Preliminary report on substantiating safety of nuclear power plant\*
2. General program for ensuring quality -- POKAS(O).
3. Partial programs for ensuring quality - POKAS(VP), POKAS(P), POKAS(RU), POKAS(R)\*\*
4. Design documents, reports on tests and experimental design work, alluded to in the "Preliminary Record for Substantiation of Safety,"
5. Probable analysis of safety of nuclear power plant.
6. Information on permits obtained up to time of presenting application.
7. Program of measures to ensure physical safety of AS and nuclear materials (confidential).

*\* The "Preliminary report on substantiating safety of nuclear power plants" is drawn up in accordance with the "Requirements for Reporting on Substantiation of the Safety of Nuclear Power Plants," approved by Russian Gosatomnadzor.*

*\*\* POKAS(R) is in the set of documents substantiating the application at the level of the main organizations developing equipment for nuclear power plants according to the condition at the time the application is presented.*

**B. For AS Units Under Construction:**

1. TOB AS in the volume required by PNAE G-001-85.
2. Materials of the design for construction of an AS, of the technical design for the reactor unit, ASU TP. The number of materials being submitted is determined by Russian Gosatomnadzor for each specific AS unit.

**C. For facilities (RAO, KhoYaT etc.), the construction of which is carried out on the territory of existing AS according to individual itemized lists, the number of documents substantiating the application is determined by Russian Gosatomnadzor in each specific case.**

**Appendix No 6**

**Russian Federal Oversight of Nuclear and Radiation Safety**

**Provisional Permit for Construction of a Nuclear Power Plant Unit**

No \_\_\_\_\_

Issued "\_\_\_" \_\_\_\_ 199\_\_

Russian Gosatomnadzor, in fulfilling its authority, and convinced that the provisions on construction of a nuclear power plant, set forth in the materials enclosed with the application, correspond to the normative-technical documentation regulating this activity, and also on the basis of the fact that the activity defined by the provisional permit will be carried out in the future in accordance with the above-mentioned normative-technical documentation and in adherence to the enclosed conditions, issues a provisional permit for construction

\_\_\_\_\_  
(name of nuclear power plant unit, unit number, power element)

at the site \_\_\_\_\_

\_\_\_\_\_  
(location of site)

and belonging to \_\_\_\_\_

\_\_\_\_\_  
(name of Enterprise)

address \_\_\_\_\_

in accordance with the application.

Reason: application No \_\_\_\_\_ of " " \_\_\_\_ 199\_\_

This permit is in force, given the fulfillment of the conditions of action set forth in the appendix to this provisional permit.

This provisional permit goes into force " " \_\_\_\_ 199\_\_

The accompaniment of the provisional permit is carried out by \_\_\_\_\_  
district of Russian Gosatomnadzor.

Appendix:

1. \_\_\_\_\_

Chairman of Russian Gosatomnadzor

(last name, first name, patronymic)

## Appendix No 7

**MODEL LIST of Basic Requirements To Be Included in the Conditions for a Provisional Permit for Construction of a Nuclear Power Plant Unit To Be in Force.**

1. The Enterprise must ensure that construction of the nuclear power plant, its systems and elements are in accordance with the design.
2. The Enterprise must inform Russian Gosatomnadzor on all events occurring during construction of the nuclear power plant which led to or could subsequently lead to a change in the content of the materials on the basis of which the provisional permit was issued.
3. The Enterprise should carry out construction of the nuclear power plant in accordance with the requirements of the normative-technical documentation on nuclear and radiation safety.
4. The Enterprise must take the corrective actions which Russian Gosatomnadzor may require of it to ensure nuclear and radiation safety.
5. The Enterprise should store and keep in working condition the set of documents pertaining to the safety of the nuclear power plant, including the documents alluded to in the application.
6. The Enterprise must carry out its activity in accordance with the approved program to ensure quality POKAS(O) and monitor the fulfillment of particular programs to ensure quality, covering all stages of work for which this provisional permit is issued.
7. The Enterprise bears full responsibility for adherence to legislative acts regulating the statutes and conditions for the provisional permit to be in force.
8. If at the time of obtaining the provisional permit, the Enterprise has sufficient grounds for not being able to present individual materials, from the number determined necessary by Russian Gosatomnadzor, of accounting or experimental data or specific design decisions substantiating the safety of the AS, then with the approval of Russian Gosatomnadzor, it should indicate the periods for submitting these materials to Russian Gosatomnadzor and substantiate the possibility of submitting them in the period indicated. This should be reflected in the conditions for the provisional permit being in force.
9. All changes in the materials enclosed with the application to obtain a provisional permit, on questions within the competence of Russian Gosatomnadzor, are entered in the permit of Russian Gosatomnadzor.
10. The force of the provisional permit may be suspended or discontinued if the information for its issue has become invalid or the conditions for its being in force have not been observed.
11. The Enterprise should store and transport fuel and radioactive wastes at the site in accordance with the normative-technical documentation regulating these procedures.
12. The Enterprise should submit to Russian Gosatomnadzor a report on the activity to ensure quality in accordance with the programs to ensure quality at each intermediate stage of work and after the entire volume of work defined by the provisional permit has been completed.
13. All necessary changes in the materials to substantiate safety (TOB or "Preliminary Report on Substantiation of Safety"), which have arisen as the result of work done during construction of the AS, including those according to the results of the conclusion of the defined stages of experimental work and accounting substantiations, should be entered and approved at Russian Gosatomnadzor.
14. Work to prepare and make out the "Report on Substantiating the Safety of an AS" is done continuously as work on developing the nuclear power plant moves forward. At each given point in time, the "Report..." should reflect the actual state of the AS.

**Nuclear Power Industry on the Verge of the 21st Century**

947F0069A Minsk IZVESTIYA VUZ I  
ENERGETICHESKIKH OBYEDINENIY SNG  
in Russian No 11-12, Nov-Dec 93 (manuscript received  
17 Jun 93) pp 75-82

[Article by A.A. Mikhalevich, corresponding member, Byelarus Academy of Sciences and doctor of technical sciences, Power Engineering Problems Institute, Byelarus Academy of Sciences; UDC 621.039]

[Abstract] At the end of 1992, the government of the Republic of Byelarus approved a national energy program through the year 2010. According to the program, the republic's first 500- to 1,000-MW nuclear power plant units should become operational by 2005. In view of that fact, world trends regarding nuclear reactor design were summarized, and the costs and relative safety of nuclear and thermal electric power plants were compared. The major points of summary were as follows: Between 1990 and 2005, gross production of nuclear power in the European Community, United States, Japan, and the states of the former Socialist camp in Eastern Europe will likely decrease by half, whereas it will increase by a factor of 1.5 in the republics of the former USSR. At the beginning of 1992, 420 nuclear power units with a total capacity of over 326 million kW were in operation, and 76 with a total capacity of 62 million kW were being built. Nuclear power plants produced 17 percent of all electric power. More than 50 percent of that amount was produced in four countries (France, Belgium, Lithuania, and Sweden), and more than 30 percent was produced in 11 countries. By 2005, about 150 power plant units will have reached the age of

30-40 and will need to be decommissioned. The decommissioned units will be replaced by units with new-generation reactors that will be much safer. Many of the new units will likely contain "simplified" pressurized water reactors (SPWR) that are based on the principle of passive afterheat removal by means of natural circulation, automatic pressure reduction, passive injection of borated water into the reactor's cooling system, and passive cooling of the containment by natural convection and condensation. The new-generation reactors will have other improvements as well, including several barriers and stand-by safety systems, improved control systems, the ability to withstand extreme loads (earthquakes, planes crashing into them), stable operation in all modes thanks to cores with improved neutron physics characteristics (reactivity margins and coefficients), refueling cycles of 1.5 to 2 years, and operating lives of 50-60 years (instead of the current 30-40 years). CANDU and new-generation light-water reactors will also likely be in operation after the turn of the century. It is thought that by the year 2,000, bringing 600- and 1,200-MW nuclear power plants on line will require 5 and 6 years respectively versus 3.5 and 4 years for coal-fired plants and 2 and 3 years for gas-fired power plants of the same capacities. Although cost comparisons of the different types of power plants vary depending on the individual fuel cost projections used, it is likely that given a capacity factor of 85 percent, the cost of producing electric power at a nuclear power plant at the turn of the century will be 15 to 20 percent less than at new-generation thermal electric power plants. Figures 2, tables 4; references 8 (Western).

#### Obtaining Hydraulic Oil from Baku Oils

947F0075A Moscow *KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL* in Russian No. 12, 1993 pp 6-7

[Article by F. I. Samedova, A. M. Kasumova, V. M. Aliyeva, Mamedaliyev Institute of Petrochemical Processes, Academy of Sciences of the Azerbaijani Republic; UDC 665.637:665.662.2]

[Abstract] The demand for hydraulic oil currently exceeds production capabilities. Typically, sulfuric acid scrubbing is used to produce hydraulic oil. However, hydrogenation is more ecologically sound. This article explores the possibilities of obtaining RM type hydraulic oil from oil fractions of a mixture of low-paraffin oils refined at the Azerneftiyag facility in Baku. The oil is used in the automatic control hydraulic systems of aircraft used in the north, where high demands are placed on viscosity and the pourability ( $-60^{\circ}\text{C}$ , no greater than  $350\text{ mm}^2/\text{s}$  at  $-40^{\circ}\text{C}$ ). The process of obtaining the hydraulic oil from the raw material is outlined. Three processing methods were examined and yielded satisfactory oils. The industrial gasoline fraction of a mixture of low-paraffin oils is a good raw material for RM type hydraulic oil. This oil meets standards and is comparable to Shell Tellus Oil R5. Tables 2; references 2 (Russian).

#### The Khimitekhnik-93 Exhibition

947F0075B Moscow *KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL* in Russian No. 12, 1993 p 31

[Article by T. Rykunova]

[Abstract] On 22-26 November, the international exhibition of chemical and petroleum machine building, Khimitekhnik-93, was held in Moscow. More than 120 firms and organizations from Austria, Germany, Italy, Hungary, the Netherlands, Lithuania, and Ukraine participated. Innovations in chemical production were demonstrated, as well as the capabilities of and prospects for machine building for chemical and petroleum production. Business dealings were part of the exhibition. A number of prominent firms involved in the design, manufacture, and marketing of assemblies and components presented exhibits. In addition to a vast exhibit, Russian firms presented innovations in cryogenic equipment and pumping equipment. The number of Russian firms with exhibits has tripled since 1990. The number of foreign exhibits was down. In the future, the exhibition will be held once every two or three years, and in the interim periods there will be more narrowly defined exhibitions in regions where this material is of most interest. The next exhibitions will be held in Tyumen and Perm.

#### Adding New Capacity in Siberia and Northern Kazakhstan Based on Ecologically Promising Coal-Fired GRES

947F0070A Minsk *IZVESTIYA VUZ I ENERGETICHESKIKH OB'YEDINENIY SNG* in Russian No. 11-12, Nov-Dec 93 (manuscript received 2 Feb 92) pp 86-90

[Article by V.P. Churashev, candidate of economic sciences, and I.V. Kravchenko, engineer, Economics and Organization of Industrial Production Institute, Siberian Department, Russian Academy of Sciences, and G.V. Nozdrenko, doctor of technical sciences, and Yu.V. Ovchinnikov, candidate of technical sciences, Novosibirsk Electrical Engineering Institute; UDC 621.311]

[Abstract] Before new ecologically promising coal-fired state regional electric power plants (GRES) can be sited in Siberia, Europe, and Northern Kazakhstan and used to meet Russia's power needs, coal from the Kansk-Achinsk area must be brought into the country's fuel-and-energy balance. This will entail comprehensive optimization calculations including national economic estimates of the development of power engineering and the industrial and social infrastructure, optimization of the boiler-furnace fuel balance, and prediction of the technical and economic indicators of coal-fired power plant units with new processes for using coal and scrubbing stack gases. Toward this end, associates of the Economics and Organization of Industrial Production Institute of the Siberian Department of the Russian Academy of Sciences has developed an interregional intersectoral optimization model that includes a detailed fuel-and-energy complex block (referred to as the OMMM-TEK), and associates of the Novosibirsk Electrical Engineering Institute have created a computer



simulation system to predict the technical characteristics of electric power plant units. The OMMM-TEK model is designed to evaluate (from a national economy standpoint) the following:

- development of power generation subsystems;
- large facilities of the energy economy;
- individual processes for producing, processing, and using fuel and power;
- the role of individual regions in the production and use of fuel-and-energy resources;
- and the effect of conditions of the development of the fuel-and-energy complex and its subsystems on development of the economy as a whole.

In the model, regional units representing balance constraints on the production and distribution of specified types of products, capital investments, and labor resources are combined with conditions of transport and economic ties and blocks of nonindustrial consumption. The model includes six regions (the European republics of the CIS, the European portion of Russia, Kazakhstan and Central Asia, Western Siberia, Eastern Siberia, and the Far East) and 28 sectors, including eight energy-related sectors. Six of the latter are represented in terms of natural indicators (crude coal, oil plus gas condensate, natural and by-product gas, mazut, and thermal and electric power). Also included in the model are three types of machine building related production (production of equipment specifically related to the power and fuel industries and other more types of equipment in general), pipeline transport, and six types of investments. According to calculations performed with the OMMM-TEK model and computer simulation, the highest-priority region for adding new capacity is Eastern Siberia, where the optimum GRES is one based on steam-turbine units with high-speed coal pyrolysis and release of electric power and low-temperature coke. The calculations also indicated that the development of power generation in Western Siberia and Northern Kazakhstan should be geared toward optimum steam-turbine and steam-gas GRES with plasma-thermal gasification of coal and release of electric power and synthesis gas. The Sharipovo region was deemed the most feasible sites for new GRES in Eastern Siberia, the Barabinsk and Omsk areas were deemed most feasible sites for new GRES in Western Siberia, and the Yesil area was deemed most favorable in Northern Kazakhstan. Figures 2; references 3 (Russian).

## INDUSTRIAL ENGINEERING

### Analysis of the Dynamics of a Shaft Line With Rigid and Elastic Deadwood Bearings

947F0086A Moscow PROBLEMY  
MASHINOSTROYENIYA I NADEZHNOСТИ MASHIN  
in Russian No. 1, 1994 (manuscript  
received 13 Apr 92) pp 25-30

[Article by A. S. Kelzon, N. V. Yanvarev, V. G. Muramovich, St. Petersburg; UDC 629.12.037.6]

[Abstract] A shaft line with a mass distribution featuring a suspended mass on two supports one of which is pliable is mathematically modeled to examine the effect of the

rigidity of the pliable support on the dynamic characteristics of a propeller shaft-stern deadwood bearing system. The dynamics of the shaft drive on the Arktika nuclear icebreaker are calculated using this model. It was found that as the capacity of icebreaker power plants increases, the amount of vibrations in the stern end of the hull becomes untenable, and leads to fatigue cracks and damage to the deadwood bearings. The energy of the interaction of the propeller and the ice must be optimally distributed. Two cases are examined: 1) a single impact of the propeller blade with the ice and transition processes in the shaft line caused by the impact; 2) induced transverse vibrations of the shaft line due to a periodic pulse load caused by the interaction of the propeller with the ice. The optimal rigidity of the deadwood bearing support is 150 MN/m. The problem of determining the rigidity parameters of the supports of the deadwood bearings should be solved by optimizing the bearing parameters in each case using supports with an adjustable rigidity, which makes it possible to adjust them away from the critical frequency over the entire range of frequencies of rotation of the propeller shaft. Figures 5; references 4 (Russian).

### Properties of Turbine Blade Ceramic Coatings Obtained With Electron-Beam Technology

947F0086B Moscow PROBLEMY  
MASHINOSTROYENIYA I NADEZHNOСТИ MASHIN  
in Russian No. 1, 1994 (manuscript received  
28 Sep 93) pp 74-80

[Article by Yu. A. Tamarin, Ye. B. Kachanov, S. V. Zherzdev, Moscow; UDC 629.7.023.22]

[Abstract] This paper examines the creation of condensed heat-resistant coatings for cooled working blades of the gas turbines of aviation engines and energy plants. The evaporation of  $ZnO_2-V_2O_5$  ceramics are studied and a coating with a columnar structure is formed. The basic thermophysical properties of ceramic coatings are studied. Ceramic condensed coatings are highly resistant to thermal loads and were not damaged during prolonged tests on aviation engines. The coatings protect blade surfaces from high-temperature corrosion and the blade material from weakening due to high temperatures. The characteristics of ceramic coatings in general are listed. Two ceramics were tested, KDP-1 and KDP-4. The conductivity of KDP-1 was close to that of a  $ZrO_2$  single crystal. The main cause of coating failure is oxidation of the ceramic-metal interface; other causes are listed. The oxidation causes a continuous reduction in the adhesion of the ceramic coating. This may be reduced by alloying and reducing the diffusive mobility of oxygen. At temperatures below 1100° the coatings may last 10,000-15,000 hours. Figures 4; tables 3; references 4: 3 Russian, 1 Western.

## MECHANICS OF GASES LIQUIDS, AND SOLIDS

### Cumulation of a Flat Shock Wave in a Tube by a Thin Parietal Gas Layer of Lower Density

947F0087 Minsk INZHENERNO-FIZICHESKIY ZHURNAL in Russian Vol. 65 No. 3, 1993 (manuscript received 31 Jun 92) pp 302-305

[Article by V. I. Bergelson, I. V. Nemchinov, T. I. Orlova, V. M. Khazins; UDC 533.6.011]

[Abstract] This paper presents a numerical analysis of a new effect of shock wave focusing which is caused by a thin extended gas layer of lower density at the side wall of a cylindrical tube when a wave is reflected from the flat end

of the tube. The gas layer is in front of the shock wave and normal to the wave. It is shown in a model (using Euler equations and an antidiffusion scheme) that the gas dynamic parameters in the vicinity of the center of the end face increase by a factor of 5-10 (for strong shock waves) compared to the parameters trailing a reflected stationary flat shock wave. The diffuse gas layer may form naturally due to heating by heat fluxes from the front of a strong shock wave, or may be formed artificially by heating the surface. An isobar figure illustrates shock wave configuration and currents behind the shock wave just after it is reflected from the end of the tube. The increased pressure is a local and short-lived effect, but it is strong. Large-scale eddies are formed after the shock wave is reflected. The effect must be experimentally verified. Figures 5; references 8: 6 Russian, 2 Western.

## BIOTECHNOLOGY

### **Anabaena Thermalis: Nitrogen-Fixing Cyanobacterium Associated With Rice**

947C0120A Kiev BIOPOLIMERY I KLETKA  
in English Vol. 8 No. 3, Sep-Oct 92 pp 44-47

[Article by V.H. Nguyen, M.F. Alekseyev, N.A. Kozlovskaya, V.A. Kordyum, J. Elhai, Experimental Biology Institute, Viet-Nam, Molecular Biology and Genetics Institute at the Ukrainian Academy of Sciences, Kiev, and Michigan State University; UDC 579.25]

[Abstract] Rice inoculation with nitrogen-fixing cyanobacteria and the resulting increase in the rice yield without the use of mineral fertilizers and the factors which affect the success of inoculation are discussed, and an attempt is made to identify the characteristics which are critical for enhancing the rice yield. To this end, eleven strains of nitrogen-fixing cyanobacteria were isolated from the stems of wild rice grown in nitrogen-poor marshes of Viet-Nam; they were purified and ranked on the basis of their ability to adhere to the rice stem. The most adherent strain (*Anabaena thermalis* SpA) is examined in great detail. Electron microscopy studies of this filamentary strain reveal that when it is purified, the strain is capable of penetrating deep into the root interior of surface-sterilized rice plants. Efforts to manipulate *Anabaena thermalis* SpA genetically were made in order to ascertain whether nitrogen fixing and adherence are indeed the critical factors which underlie the strain's reported ability to enhance the rice yield. It is demonstrated that *Anabaena thermalis* SpA does not possess a DNA restriction-modification system which might limit the introduction of foreign DNA into the strain. The absence of these systems should facilitate genetic manipulation of the strain. The authors are grateful to Vladimir Tarasenko for assistance with scanning electron microscopy. Figures 3; references: 12 Western.

### **Production of Monoclonal Antibodies to Rat Kidney Chromatin Nonhistone Protein Associated With Hepatoma**

947C0142A St. Petersburg TSITOLOGIYA in Russian  
Vol. 35 No. 9, Sep 93 pp 57-61

[Article by A.B. Grandilevskaya, D.G. Polyntsev, V.P. Kushner, V.A. Ivanov, Cytology Institute and Human Brain Institute at Russia's Academy of Sciences and Palmer Joint Venture, St. Petersburg]

[Abstract] Chromatin's nonhistone proteins (NGB)—a multicomponent group of proteins some of which may regulate gene expression—which are specific to tumoral and actively proliferating tissues are discussed, and it is noted that a lack of universally accepted methods of isolating nonhistone protein makes it difficult to compare the results obtained by different researchers in various labs while the molecular and biological mechanisms of the nonhistone proteins' participation in cell

proliferation and dysdifferentiation remain unclear. This calls for a specific tool, such as monoclonal antibodies. An attempt is made to produce monoclonal antibodies to certain nonhistone protein fractions of intact rat kidney cells associated with hepatocellular tumors. To this end, 120-150 g male BALB/c rats are used, and nonhistone protein-DNA complexes and nonhistone proteins are isolated from the liver and kidneys of intact rats. The experimental procedure is outlined. The resulting 5D2 MCAs are specific to renal nonhistone protein antigen associated with hepatoma and are not found in normal liver; they have a molecular mass of 23 kDa and are characterized by their own phosphoprotein kinase activity. This protein is among other proteins identified in tumors of heteroorganic nonhistone protein antigens of a renal origin which may play the role of endogenous factors in cell proliferation and dysdifferentiation; the antibodies make it possible to examine the regulatory mechanisms of such factors in greater detail. Indirect immunofluorescence studies of rat hepatoma 27 cells nuclei produced by these antibodies revealed a specific speckled luminescence pattern which is not observed in normal hepatocyte nuclei. Figure 2; references 16: 7 Russian, 9 Western.

### **Stimulation of Immune Response to *Bacillus Anthracis* Protein Toxin Using Water-Soluble Polyions**

947C0131A Moscow IMMUNOLOGIYA in Russian  
No 3, May-Jun 93 pp 31-34

[Article by R.M. Khaitov, S.F. Suleymanov, N.G. Puchkova, A.V. Nekrasov, R.I. Ataullakhanov; UDC 615.919:579.852.11].015.46.07]

[Abstract] The role of the p90 protein toxin produced by *Bacillus anthracis*—an important element of anthrax pathogenesis—in developing antitoxin antibodies which make it possible to protect the infected organism from death and the lack of data on the immunogenic properties of the purified p90 toxin, making it difficult to use it as a vaccine, prompted a search for methods of increasing p90's immunogenic properties in order to develop a means of specific anthrax prevention. To this end, the possibility of activating the immune response to p90 determinants by means of adjuvants of a polyion origin, particularly polyoxonium (PO), a preparation approved for use as an immunoadjuvant vaccine component by the USSR Pharmacological Committee, and dextran sulfate (SD), an immunostimulating polyion which is generating much interest due to the discovery of its blocking effect on HIV replication, is investigated. In so doing, 18-24 g (CBAx57BL/6)F<sub>1</sub> mice and p90 antigen from the Northern Caucasian and Trans-Caucasian Antiplague Research Institute are used. The experimental procedure is outlined. One-time subcutaneous immunization with 0.1-10 µg of p90 antigen induced a very weak production of IgM antibodies specifically

binding p90 in an ELISA study while repeat subcutaneous injection led to a p90-specific intense antigen-formation reaction. The accumulation of p90 antigen-specific M- and G-class antibodies in the mice blood serum after one- and two-time immunization, the level of p90-specific antibody isotypes in the mice blood serum two weeks after reimmunization, and the delayed hypersensitivity reaction rate estimated by the edema magnitude (VO) and relative edema index (OIO) are summarized. The secondary p90 IgG antibody production in mice as a function of the antigen dose is plotted. The study demonstrates that polymer immunostimulators are capable of greatly enhancing the immune reaction against the protective p90 antigen from the anthrax etiological agent, and that dextran sulfate is much more effective than polyoxidonium. It is noted that the results are not sufficient for drawing general conclusions about the immunostimulating properties of polyoxidonium. Figures 1; tables 4; references: 7 Western.

**Effect of Various Immunomodulator Groups on Immunological Indicator Dynamics in Chemical Industry Workers**

947C0131B Moscow IMMUNOLOGIYA in Russian  
No 3, May-Jun 93 pp 53-54

[Article by A.V. Kulakov, A.V. Simonova, A.S. Grinevich, A.I. Martynov, N.M. Golubeva, B.V. Pinegin, Immunology Institute of the Russian Federation Ministry of Public Health; UDC 616-092:612.017.1]-057-02:613.632]-02:615.275.4]

[Abstract] The negative impact of formaldehyde, methanol, cresol, and other substances used in the chemical industry on the immune status of the workers who come into contact with them, thus lowering their body resistance and increasing infectious morbidity, prompted an attempt to employ various groups of immunomodulators to correct the detected immunity impairments and restore the organism's resistance. To this end, workers from the Khimplast chemical plant in Nizhniy Tagil were subjected to immunocorrective therapy, and the first immunological examination was carried out in 1989. The experimental procedure is outlined. An analysis of the impact of immunomodulators on the immune status parameters revealed changes which develop under the effect of all, most of, or particular immunomodulators examined in the study. The immunological indicators of chemical industry workers before and after immunocorrective therapy and the effect of immunomodulators on morbidity are summarized. Immunopreventive treatment of workers suffering from frequent and prolonged illnesses with the help of such immunomodulators as dibazol, eleutherococcus, methyluracyl, shilagide, vilosene, and thymoptine shows that a statistically significant decrease in morbidity was attained only in those receiving methyluracyl and thymoptine. An analysis of the immune status behavior under the effect of immunotherapy with methyluracyl and thymoptine reveals that these changes have different trends which may attest to the absence of a direct correlation between

an increase in immunoreactivity and the observed changes in the immune status. Tables 2; references 11: 10 Russian, 1 Western.

**Immune Status in Members of Chernobyl Nuclear Power Plant Accident Cleanup Crew With Neuropsychological Disorders and Efficacy of Immunocorrection**

947C0131C Moscow IMMUNOLOGIYA in Russian  
No 3, May-Jun 93 pp 55-58

[Article by V.M. Frolov, N.A. Peresadin, S.Ye. Kazakova, Ye.F. Safonova, Lugansk Medical Institute; UDC 616.89-02:614.876]-092:612.017.1]-085]

[Abstract] The small number of Chernobyl cleanup crew members who worked close to the damaged reactor and were examined afterwards and the high rate of neurological-psychiatric disorders among them against the backdrop of the high level of environmental pollution in the region which leads to the development of secondary immunodepression prompted a clinical immunological analysis of data on 280 such patients hospitalized in the neurological ward of the Lugansk oblast clinical hospital. To this end, 270 21-42 year old men and 10 women, including 125 servicemen, 98 miners, 46 drivers, and 11 workers in other areas who worked in the Chernobyl zone in 1986-1987 and were exposed to various irradiation doses were examined. The examination procedure, including an ultrasonic study, is outlined. The cellular and humoral immunity factors in the patients under study and the effect of thymalin on the immunological indicators of the cleanup crew members are summarized. The study reveals an immune status impairment in 94.6% of patients, 45% of it rather marked, e.g., T-lymphopenia, a considerable increase in the number of incomplete rosettes, etc., making it possible to speculate that the persistent immune shifts in most patients are due not only to the aftereffects of a relatively small exposure 5-6 years ago but also the effect of environmental pollution at the place of subsequent residence. In 80% of the patients, thymalin makes it possible to compensate for secondary immunodeficiency. Tables 3; references 14.

**Effect of Sleep Inducing Peptide in Primary Immune Response**

947C0131D Moscow IMMUNOLOGIYA in Russian  
No 3, May-Jun 93 pp 61-62

[Article by A.M. Mendzheritskiy, I.I. Mikhaleva, Ye.Yu. Zlatnik, A.I. Polyak, Scientific Research Institute of Neurocybernetics at the Rostov State University, Rostov Medical Institute, and Scientific Research Institute of Bioorganic Chemistry imeni M.M. Shemyakin, Moscow; UDC 612.017.1.014.46.08]

[Abstract] The close correlation between the neuroendocrine and immune systems, particularly that mediated by hormones, is discussed, and the role of the  $\Delta$ -sleep



inducing peptide (DSIP), a nonapeptide isolated from the brain, as a factor which stimulates the  $\Delta$ -wave sleep phase is investigated. In particular, the effect of a synthetic  $\Delta$ -sleep inducing peptide on the primary immune response to ram erythrocytes under the post-traumatic stress conditions is examined. To this end, an experiment was carried out on 300 BALB/c mice divided into seven groups. Various doses of  $\Delta$ -sleep inducing peptide were administered intraperitoneally to the mice at different time intervals, and some groups were exposed to stress after a mechanically-induced trauma. The effect of various  $\Delta$ -sleep inducing peptide doses on the number of antibody-producing cells (AOK) in the mice spleen, and the effect of different  $\Delta$ -sleep inducing peptide doses on the hemolysine level in the mice serum are plotted. The findings attest to a light and brief immunostimulating effect of mean  $\Delta$ -sleep inducing peptide dose of 12  $\mu$ g/100 g, and it is noted that this dose is the most efficient as antistress agent under cold-and hypokinetic-induced stress. One-time injection of this dose displayed immunostimulating properties not only in intact animals but also in stressed animals. Figures 2; references 12: 8 Russian, 4 Western.

## EPIDEMIOLOGY, MICROBIOLOGY, AND VIROLOGY

### Import of Malaria From Afghanistan to the USSR: Retrospective Analysis of Materials From Epidemiological Surveys of Cases and Foci for 1981-1990

937C0421 Moscow MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI in Russian No. 3, May-Jun 92 (manuscript received 10 Oct 91) pp 15-18

[Article by V. P. Sergiyev, A. M. Baranova, and L. P. Arsenyeva; Institute of Medical Parasitology and Tropical Medicine imeni Ye. I. Martsinovskiy (IMPiTM), Moscow]

[Abstract] A retrospective analysis of malaria imported due to military operations revealed primary characteristics of the behavior of the *Plasmodium vivax* population and relationships between the imported parasite and the native *Anopheles* species. A high percentage of cases with protracted incubation was noted in soldiers after they had returned home; clinical symptoms of tertian malaria often registered 7-12 months after their return. There were no epidemic consequences of imported cases of tertian malaria in malariogenic areas or of secondary infections from imported cases. The effect of mass drug administration in military contingents was proved to be low due to irregular or discontinued use of the drugs. The import of sources of infection to malariogenic areas was found to cause a minimal risk of restoration or implantation of tertian malaria. The current epidemiological monitoring system was shown to be rather effective in supporting the welfare of the country. Figures 2; references 12: 5 Russian, 7 Western.

### Causes of Growth in Incidence of Pertussis and Forecast for Next Few Years

947C0160A Moscow ZDRAVOOKHRANENIYE ROSSIYSKOY FEDERATSII in Russian No 1, 1993 (manuscript received 19 Aug 92) pp 19-22

[Article by L. A. Sigayeva, L. S. Kuznetsova, and M. S. Petrova, Moscow Research Institute of Epidemiology and Microbiology imeni G. N. Gabrichevskiy; UDC 616.921.8-036.2-07-037]

[Text] Maximum reduction in incidence of childhood infections and their eradication are the end goal of all epidemic-control work have always been related to the expectation of mass use of active immunization. But thus far, full suppression of the epidemiological process and eradication of infection by means of preventive vaccines on the global scale have been achieved only for smallpox (1977). Success became possible thanks to development of long-term strong postvaccinal immunity of the people in all countries in the absence of latent forms of disease.

In 1983, at a session of the European Region Office of WHO, the goal of good health for all by the year 2000 was formulated for European countries. As it relates to communicable diseases, by the year 2000 there are five diseases that must not exist in Europe: local measles, poliomyelitis, neonatal tetanus, congenital rubella and diphtheria. There was no discussion of diseases such as pertussis and meningococcal infection. Yet, vaccines against them have been developed, and these diseases could be classified as potentially controllable infections. What is the matter?

In the pre-inoculation period, the incidence of pertussis in the nation as a whole constituted 360-390 per 100,000 population, reaching higher figures in years of periodic rise. About 80 percent of all those stricken were children up to 5 years old. A high incidence of infections was consistently noted in children's institutions and schools: diseases were recorded in 98 percent of the creches, 78 percent of the nursery schools and 73 percent of the schools. Mortality reached 0.37 percent, and it was particularly high among infants up to 1 year old.

The incidence of pertussis was also high in other countries. Prior to the practice of vaccination, the highest morbidity rate was noted in Denmark, reaching rises to 1735-1849 per 100,000 population; in 1953, it constituted 771 in Finland, 380 in England and 60-79/100,000 in the United States. Even in those years, the incidence of pertussis was rather low in a number of countries (Mexico, Turkey, Japan, Iran, Italy, and others), and this was related to the lack of keeping records of pertussis due to poor medical care of the public.

Mass preventive vaccination against pertussis began to be practiced in our health care system and most other countries in the late 1950s and early 1960s, i.e., more than 30 years ago. At first, monovalent vaccines was

used, and later associated ones—DPT and ADPT. Coverage with inoculations of children up to 5 years old increased consistently and reached 99.8 percent in 1964 (data for Moscow).

Analysis of incidence of pertussis in RSFSR revealed that it declined to one-half in 1961-1962, as compared to 1959. In subsequent years there was further decline in morbidity and it reached 49/100,000 population by 1967-1968. Since 1970, while the mean republic indicator was 16.9, there were already regions where only isolated cases of pertussis were reported. The clinical course became milder, fatalities became rare, and the mortality rate showed a 3.1-fold decline.

An analogous situation developed in other countries as well. For example, in the United States, immunization of children against pertussis began to be practiced extensively in 1943-1945. By 1950, the morbidity indicator already dropped to 79.8, it constituted 9.5 in 1962, 1.1 in 1974, and 0.47 in 1976. In England, immunizations were started in 1951, with an indicator of 385. It dropped to 41.1 in 1962, 32.2 in 1963, and 4.9 in 1964. In Japan, inoculations were started in 1948. In 1963, the morbidity rate dropped to 1/32 of the 1950 figure (4.1/100,000 population).

The data of Russian and foreign authors indicate that pertussis control is successful with the use of specific preventive agents. The opinion was voiced that it would be possible to lower the incidence of pertussis in our country to isolated cases by 1970-1971, and to eradicate pertussis provided there was 90 percent coverage of children up to 5 years old with inoculations [2].

But it was subsequently learned that the pertussis vaccine has only a limited effect on the epidemic process; this was manifested by insufficient strength and duration of postvaccinal immunity and deficiencies in the system of using inoculations [1, 3-5].

In the 1970s, morbidity became stabilized at a relatively low level (5.8-10.8-11.7) in the RSFSR, but there was still a contrast in level of recorded morbidity. In some instances, the lack of records on pertussis cases in several territories of Russia was evaluated as eradication of pertussis.

In the last 10 years (from 1981-1982 to the present), the rise in incidence of pertussis that had started in Russia led to its generalized spread. At the present time, the morbidity level is 1.5-2 times higher than the 1970s level. The indicators of morbidity in years of periodic rises, which are recorded every 2-3 years and have become more pronounced, reached maximum levels in the late 20 years 15.1 (1982), 28.7 (1985), 23.5 (1988), and 28.8 (1991). The annual number of new cases exceeds 20,000-30,000. In the last 4 years, the morbidity rate was on the level of 10-30/100,000 in 50 percent of all krays and oblasts of Russia.

In addition to periodicity of rises in morbidity, it is also seasonal. Manifestation of this typical feature in the

epidemic process of pertussis is demonstrable in regions where its detection and registration are best. The highest morbidity is recorded in the fall and winter, elevation begins in July-August and it is lowest in the spring and summer.

The number of new cases increases primarily among the urban population; in the 1980s, urban morbidity was 4-5 times higher than in rural areas: 21.0-25.8 versus 5.4-6.8 in 1990 and 1991; in 1990-1991, the highest morbidity was noted in St. Petersburg (75.2-80.9), Moscow (63.8-69.0), Novosibirsk (39.1-62.0) and Nizhny Novgorod (20.55-49.1) oblasts.

This disease strikes mainly children up to the age of 14 years; among them the morbidity rate constituted 74.7-88.9 for the last 2 years. Most often, pertussis is recorded among infants, up to the age of 1-2 years, and the morbidity rate for them averages 154.7-136.1, reaching 200-600 or more per 100,000 children of this age group in some regions, and particularly urban areas. For example, in 1989-1990, the lowest recorded morbidity indicators (to 50) among children up to 2 years old were found in only 9-13 oblasts (Rostov, Tomsk, Amur, Kamchatka, Buryatia, Checheno-Ingushetia and others), and the very lowest indicator (5.8) in 1989 was found in Buryatia. The indicators are in the range of 500-100 in 18-26 oblasts, with a larger share of oblasts with high morbidity levels: 38 territories in 1989 and 42 in 1990. The highest morbidity (200 to 600 or more) in the last 4 years has been noted in St. Petersburg, Moscow, Ivanovo, Novgorod, Orlov, Nizhny Novgorod, Ryazan, Voronezh, Astrakhan, Novosibirsk oblasts, Altay and Stavropol krays, in Tataria, Mari El and Chuvashia.

The chief cause of rise in incidence of pertussis is, no doubt, the reduction in the immune stratum among children. Already in 1970-1972, a decline began in coverage of children with inoculations. The number of those inoculated dropped first of all because of the increase in number of children with medical objection to inoculations from 8.4 in 1969 to 41 in 1976. According to official statistics, coverage with pertussis inoculations was very low in RSFSR in 1988. It is only in 26.6 percent of the territories that the number of inoculated infants 1 year old constituted 81-90 percent. Over 28.3 percent of the territories, coverage with inoculations of children of this age does not exceed 60 percent. Among 3-year old children, this indicator constituted 81-90 percent in 30 percent of the territories, and it is considerably lower in the rest. There are territories where only 28-35 percent of the children 1-3 years old were inoculated. In the last 2 years (1990-1991), 65 percent or more of the children were inoculated only in 49.4 percent of the territories, whereas the same figure for revaccination of children 3 years old applies to 58.2 percent of the territories. As compared to 1988, in 1990 the share of inoculated year-old infants dropped from 64.7 to 58.7 percent, and that of 3-year children, from 74.6 to 62.7 percent. The number of oblasts with very low inoculation coverage is growing: the share of inoculated children 1-3 years old

constituted only 25-32 percent in St. Petersburg, Maritime Kray, Murmansk and Lipetsk oblasts, Tataria and the Gorno-Altay Republic.

A comparison of morbidity rate and inoculation indicators in recent years clearly shows that they are interrelated. We previously demonstrated a trend toward increase in share of uninoculated children among the new pertussis cases in the 1980s, as compared to the 1970s: from 25 to 65-70 percent [6, 7]. It persists to this day. Expressly the continuing decline in number of children inoculated against pertussis is the chief cause of rise in morbidity over most territories of our country. While the highest morbidity rate was found for Moscow for the past 10-15 years, which was attributable to the low coverage with vaccinations and better clinical and laboratory diagnostication [6, 7], in the last 2 years St. Petersburg has advanced to first place in Russia morbidity rate, and it has the lowest share of children inoculated against pertussis: only 25.2 percent were vaccinated and 28.4 percent were revaccinated.

The decline in severity of pertussis and associated lethality in the 1970s causes pediatricians to give it dramatically less attention. The significant difference between morbidity rates of different territories could be indicative not only of difference in specific immunity, but also of quality of detection. It was learned that the level of bacteriological detection is extremely low in most territories and, in spite of this, the diagnosis is established primarily on the basis of detection of the pathogen. Even in Moscow, where detection is better on the whole, the diagnosis of pertussis is made on the basis of clinical symptoms alone in only 22.4 percent of the cases. Moreover, analysis of clinical diagnostication in somatic hospitals revealed that, in some cities, the share of pertussis cases referred to them constitutes 19-45 percent or more. In addition, pertussis is recorded exclusively for infants up to 1 year old in most territories, and this is also indicative of a low level of clinical detection of pertussis in older children and adults, in whom the disease is milder.

Poor detection is attributable to incomplete and, as a rule, late performance of bacteriological tests for pertussis among the sick. There is virtually no screening of patient contacts in children's preschool institutions and schools, as well as of those who have a protracted (for more than 5-7 days) cough for the purpose of early detection of the sick. For this reason, demonstration of pertussis and parapertussis bacteria in culture is poor everywhere. In the 1980s, 40-46 percent of all instances of isolating a culture of pertussis bacteria in Russian laboratories were carried out in Moscow.

Many years of epidemiological surveillance of pertussis in Moscow make it possible to predict the epidemic situation. Thus, as far back as 1984, we demonstrated that the retarding effect of specific prophylaxis on the epidemic process weakens due to the increase in number of uninoculated children; we need urgent steps to reduce their number, otherwise it is possible that more severe

symptomatology of pertussis and intensification of the epidemic process will recur [5, 7, 8]. Unfortunately, the prediction came true: at the present time, we have an adverse epidemic situation for pertussis in Russia.

In the presence of the attenuated effect of specific prophylaxis, there have been changes in the symptomatology of the disease: it is more manifest—i.e., there is an increase in number of infants 4-12 months old with moderately severe forms of pertussis and in number of children over 1 year old at sites of infection with typical forms of the disease (from 65.4 to 83.6 percent). As in preceding years, there is prevalence of mild forms of pertussis among children over 1 year old, and the moderately severe form is encountered more often among those who were not inoculated than in those who were.

The 3-8-fold increase in number of children in preschool children's institutions and schools who are not vaccinated has led to a growth in sites of infection: 5 to 12 cases recorded in 50 percent of such sites.

Increased toxicity of strains of *Hemophilus pertussis* bacteria isolated from patients is particularly alarming. While there is predominant circulation of serotype 1.0.3, there has been a rise from 55.6 to 80 percent in share of moderately toxic strains. In recent years, highly toxic strains, which appeared in 7.4 percent of the cases in the early 1980s, are still being isolated in 5.7-11.1 percent of the cases. As compared to the toxicity of strains isolated in the 1970s, the toxicity of those isolated from patients in 1982-1988 has increased and now equals the toxicity of strains isolated in the 1960s. We related the increased toxicity to the continuing trend toward reducing the number of inoculated children, which has become particularly marked in the last 3-4 years due to negative information about vaccination in the press, radio and television.

Thus, the decrease in number of children inoculated against pertussis in recent years has led to rise in incidence of pertussis and its spread everywhere. There has been an increase in manifest nature of infection and toxicity of the pathogen, which renders the forecast concerning pertussis for the next few years unfavorable. We believe that, in such a situation, we need first of all some urgent steps to augment the immune stratum among children up to 3 years old. Unfortunately, neither rescheduling of ADPT vaccination to the age of 3 months, instead of 5-6 months, in 1980 nor its replacement in 1989 with the less reactogenic ADPT-M vaccine have led to an increase in number of children inoculated against pertussis.

We believe that we can obtain a decline in pertussis morbidity only by increasing coverage of children with inoculations, taking as the mandatory minimum 50 percent coverage of infants up to 1 year old with complete vaccination.

It is indisputable that adoption of a new vaccine, less reactogenic than ADPT, would be a cardinal solution to the pertussis problem. Development of such agents,



so-called "acellular vaccines," is in progress in our country (Ufa Research Institute of Vaccines and Sera, Moscow Research Institute of Vaccines and Sera imeni I. I. Mechnikov) and abroad (United States, Japan, England, France, FRG) for more than 20 years already. However, to date, these vaccines did not gain broad use in health care practice. In both our country and abroad, ADPT vaccine is being used as yet, and it is only in Japan that children are immunized against pertussis with an acellular vaccine since 1981.

At the present time, the quality and standard uniformity of ADPT vaccine produced in our country improved: in 1980-1985, 80 percent of its series conformed to WHO specifications for toxicity indicators. While the goal for science today is to complete with dispatch research on development of new immunogenic and less reactogenic pertussis vaccines, the immediate task for health care practice is to exercise an individual approach to immunizing children, which would permit reduction in number of unwarranted objections to pertussis vaccination and increase the coverage of children with inoculations.

Legislation adopted in 1991, which makes it mandatory to administer vaccines against six infections, including pertussis, must first of all assist pediatricians in revising their attitude toward inoculations and increase their responsibility for timely and mandatory protection of children against these infections.

In order to determine the causes of low vaccination coverage and search for ways to increase it in the first year of life, we developed a method for the health care system of carrying out ongoing analysis in each pediatric district of the status of immunization of children against pertussis, diphtheria, tetanus and measles.

Analysis is being made of timeliness of vaccination, with determination of causes for delaying its start, lack of vaccination, justification for prescribing ADP-M anatoxin instead of ADPT vaccine, medical objections, and determination of term of deferral of vaccination.

Experience with this method makes it possible to find 8 to 13 percent of the children who were not immunized on time for unwarranted medical objections and 5-8 percent of those who were not immunized due to organizational problems. Prompt elimination of the causes of delay and failure to immunize children increases coverage with inoculations by 13-20 percent among infants up to 1 year old.

Unquestionably, epidemiological surveillance of pertussis infection, which includes analysis of morbidity rate (retrospective and current), analysis of immunization status, carrying out thorough, earlier and fuller clinical and epidemiological observations at sites of infection, dynamic investigation of properties of circulating strains of the pathogen of pertussis, makes it possible to predict the situation. But, a new, safer vaccine and methods of defining immunity available to

the broad medical community, which permit evaluation of the immunological structure of the child population, are definitely needed for complete control of the epidemic process.

#### References

1. Demina, A. A., "Aktualnyye voprosy epidemiologii" [Pressing Problems of Epidemiology], Moscow, 1967, pp 100-102.
2. Zakharova, M. S., VESTN. AMN SSSR, 1962, No 2, pp 77-81.
3. Kozlova, N. A., "Epidemiologicheskaya kharakteristika koklyusha v Leningrade (1950-1971 gg.)" [Epidemiological Description of Pertussis in Leningrad (1950-1971)]a, Leningrad, 1973, pp 13-24.
4. Kuznetsova, L. S., "Kishechnyye i vozdušno-kapelnyye infektsii" [Intestinal and Airborne Droplet Infections], Moscow, 1969, pp 111-122.
5. Idem, "Epidemiology of Contemporary Pertussis and Problems of Wiser Prevention," doctoral dissertation in medical sciences, Moscow, 1979.
6. Mordvinova, N. B., Markina, S. S., Ignatyeva, G. V., et al., "Epidemiologicheskii nadzor kak osnova profilaktiki kapelnikh i kishechnykh infektsiy" [Epidemiological Surveillance as the Basis for Prevention of Droplet and Intestinal Infections], Moscow, 1990, pp 5-22.
7. Sigayeva, L. A., Kuznetsova, L. S., Okinshevich, Ye. A., et al., ZHURN. MIKROBIOL., 1986, No 3, pp 43-48.
8. Sigayeva, L. A., Kuznetsova, L. S., Petrova, M. S., et al., "Vserossiyskiy s'ezd mikrobiologov, epidemiologov i parazitologov, 6-y: Tezisy dokladov" [Sixth All-Russian Congress of Microbiologists, Epidemiologists and Parasitologists. Summaries of Papers], Moscow, 1991, pp 44-45.
9. Khazanov, M. I., Cherkasskiy, B. L., and Rybkina, N. M., ZHURN. MIKROBIOL., 1965, No 12, pp 21-28.

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#### Tactics for Control of Measles

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[Article by G. V. Ignatyeva, A. G. Gerasimova, D. K. Sadykova, and T. N. Moskaleva, Moscow Research Institute of Microbiology imeni G. N. Gabrichevskiy; UDC 616.98:578.831/-084.4]

[Text]The acuity of the problem of measles control at the present time is determined by the epidemic situation in each individual territory of the RF [Russian Federation], extent of impact of specific preventive measures on the epidemic process, and solution of the cardinal problem, that of eliminating measles infection in the European



region by 1995-2000, in accordance with the decision of the regional European Office of WHO (1984).

Theoretically, elimination of measles, which is construed as exclusion of epidemiologically interrelated measles cases in different large territories, is feasible. However, as shown by experience of developed countries that have a stable and highly immunogenic live measles vaccine (LMV) (United States, Sweden, Finland, and others), the measles virus still circulates readily in groups that are mostly inoculated, in spite of extensive immunization of children. Determination of the causes of this phenomenon is still one of the priority directions of modern science [3, 6].

Development of our own LMV [ZhKV] L-16 and a method of specific prophylaxis is a brilliant achievement of Russian scientific teams. The dynamics of measles became regressive under the effect of specific preventive measures. While maximum morbidity rate constituted 171-297 per 100,000 population in the first decade (1970s) with extensive LMV immunization of children, in the 1980s it was 84-130 with periodic rises in morbidity. The particularly low morbidity rate, 12.4-17.3, was recorded in 1989-1991, which had been atypical previously in RF territories, as was extension of the period between epidemics to 6 years.

Improvement of the inoculation schedule (vaccination of children upon reaching the age of 1 year and revaccination at the age of 6-7 years before beginning school) was instrumental in the dramatic decline of measles in Russia. Moreover, adoption by health care institutions of a scientifically validated system of epidemiological surveillance of measles infection, which made it possible to implement timely additional measures in regions with a measles problem, had a substantial impact on the measles epidemic process. As a result, low morbidity rates are presently recorded in most regions of Russia, less than 10/100,000 population; mortality and lethality of measles infection have been virtually eradicated.

At the same time, the results of epidemiological surveillance indicate that implementation of the program for elimination of measles in the RF is encountering considerable difficulties, which are related to the quality of the vaccine used (nonstandard production series of LMV L-16), unsatisfactory organization of immunizations that do not provide full coverage of children of the specified age, as well as social and ecological distinctions inherent in different parts of Russia. There are still regions where the incidence of measles is extremely high, more than 100/100,000 (Penza, Tambov, Pskov oblasts and others).

In addition, a trend is observed everywhere toward increase in number of recorded measles cases among older individuals (15 years and older), as well as infants under 1 year old. Local outbreaks of measles occur, mainly in newly formed school groups, as well as in secondary and higher educational institutions and military units [2, 5].

The epidemic situation that exists today shows that preservation of a stable low level of measles morbidity in the RF (less than 20/100,000 population) is not a simple task, especially since the problem is made considerably more complicated by social and ecological problems that have appeared in our country.

All of the foregoing makes it imperative to further examine advances in measles control and improvement of the system of epidemiological surveillance of this infection.

Many years of epidemiological surveillance of measles dynamics in different parts of the RF differing in demographic, social, ecological conditions and quality of medical care revealed a pattern: activation of the measles epidemiological process, manifested by periodic rise in morbidity and manifestation of epidemicity, seasonal occurrence and existence of sites of infection, occurred wherever more than 20 percent of the child population was susceptible to measles.

Since there is a close correlation for measles between morbidity indicators and size of the immune stratum of children, the main task, performance of which results in epidemic welfare, is a high coverage (more than 90 percent) of children up to 2 years old with LMV vaccination, as well as a high degree of protection of children over 7 years old (no more than 7 percent seronegative). These indicators are generally considered as the main criteria determining the measles epidemic situation. On their basis, as well as with consideration of the morbidity rate, a differentiated approach is recommended to implementation of the set of preventive and epidemic-control measures.

Thus, in regions where the morbidity rate is under 10/100,000, there is more than 90 percent coverage of children up to 2 years old with inoculations, and the number of seronegative individuals does not exceed 7 percent, the measures can be reduced to maintaining wide coverage of children up to 2 years old with vaccinations and immediate work at sites of infection.

In cities and regions where the morbidity rate ranges from 10 to 20/100,000 population, vaccination coverage of children up to 2 years old constitutes 70-85 percent and is not stable, whereas among those over 7 years old more than 7 percent are seronegative, in addition to the above measures it is necessary to submit children and adolescents in the 3 indicator groups (3-4, 9-10, 16-17 years) to serological testing every 3 years, followed by immunization of seronegative children 6-7 years old prior to starting school. If the morbidity rate is higher, the range of measures is expanded, mainly to include steps aimed at enhancing immunity to measles in high risk and newly formed groups.

It has been shown on the example of Moscow Oblast that such a differentiated approach to instituted measures, which have been carried out for the last 5 years, provided

a decline to one-half in morbidity rate and reduction to one-ninth in number of territories with a measles problem [1].

It should be stressed that rather favorable findings were made in assessing the efficacy of LMV revaccination of children 6-7 years of age as a mass measure. In recent years, the overall morbidity rate for measles declined by a mean of 1.7 times in the RF territories studied, mainly because of lower morbidity in the 7-10-year groups who were revaccinated with LMV. Over the 4-year observation period, there was not a single recorded case of measles among revaccinated children, and this confirms the high epidemiological efficacy of this measure [2].

At the same time, it must be borne in mind that, according to the results of serological screening, which was carried out during the revaccination period, there is a definite tendency toward increase in the group of children who are seronegative for the measles virus (on the average from 8.3 to 17.9 percent 1 and 4 years after revaccination, respectively). A high initial level of antibodies to measles virus hemolysin, as well as acute respiratory viral infection within 3 months after revaccination or a history of various allergies requiring individualized preparation of the children for immunization, had an adverse effect on establishment and maintenance of immunity to measles of revaccinated children [4].

The findings enable us to assume that LMV revaccination of children before enrolling in school cannot provide persistent epidemic welfare and further adjustment will be required in specific preventive measures to provide effective control of measles. In addition, the scientific developments of recent years confirm the desirability of LMV revaccination with use of the serological PAT [passive hemagglutination test], i.e., only for seronegative individuals. This approach not only permits omitting unwarranted LMV revaccination of children protected against measles, but also reduces considerable expenditures for this expensive and scarce vaccine.

Although we consider revaccination to be a temporary measure for elimination of vaccination flaws, we believe that, in order to stabilize the measles morbidity rate in the RF at a low level (less than 10/100,000), the main thing is to achieve a high coverage (at least 90 percent) of children up to 2 years old with LMV vaccination and proper immunization with individualized approach to children in the risk groups. This has been confirmed by the latest data of WHO (1989), according to which there is no need for revaccination, which is temporarily practiced in a number of countries to correct measles immunity of the public, upon reaching a large stratum of children up to 2 years old that are immune to measles.

In addition to the foregoing, it is necessary to promptly arrest outbreaks of measles that occur in immune groups. It should be borne in mind that, in recent years, under the effect of LMV revaccination of children 6-7 years

old, there has been a significant decrease in number of measles infection sites in the lowest school grades. In instances when measles has been brought into first to third grades, further spread of the infection is not usually observed. Sites with numerous measles cases are recorded mainly among higher grade pupils, as well as vocational and technical schools and other secondary and higher educational institutions. An insufficient actual stratum immune to measles, which fluctuates over a significant range, from 70 to 98 percent, is the chief cause of intense spread of measles in adolescent and adult groups, while the coverage of adolescents 13-17 years of age is usually high, according to medical records, and is close to 100 percent.

At the same time, observations of measles sites established that the intensity of its spread in groups depends, first of all, on the actual stratum immune to measles among contacts of sick individuals, and this can be assessed only on the basis of results of serological testing.

If the PAT shows that the level of group immunity to measles is less than 90 percent, the incidence of measles at a site constitutes 10-13 per 100 contacts of measles patients. In groups with a higher level of protection against measles (91-96 percent immune), morbidity does not exceed 3-4 percent.

How long a measles patient remains in a group, duration and severity of his catarrhal symptoms that are instrumental in droplet transmission of the pathogen, plays a rather important part in the spread of measles infection. It was found that when the source of infection was part of the group for a short time, no more than 2 days, and in the absence of catarrhal symptoms of disease during this time, no spread of infection is observed, regardless of size of the immune stratum among his contacts. These findings, which indicate that there is a possibility that the term of infectivity of a measles victim has changed under present conditions, make it necessary to further accumulate data in this direction.

It should be noted that when exposure to measles extends to 3-4 days of the prodromal period, spread of infection is not prevented even when 95 percent of the individuals are immune to measles. At such sites, measles morbidity constitutes a mean of 5.7 per 100 contacts with the sick individual, and if the immune stratum is lower (71-80 percent) it constitutes 10.1 percent.

With longer exposure (for 3-4 days of the prodromal period, first day of eruption) of the group to the first measles victim, in the presence of catarrhal symptoms of the diseases, there is usually subsequent spread of infection. Measles morbidity in such sites averages 6.1 per 100 contacts with the measles case, and the intensity of spread of infection in sites where there is long-term exposure of a group to the first measles victim is related to some extent to the actual level of the stratum immune to measles. As the number of measles-protected individuals increases from 80 to 96 percent, the morbidity rate drops from 13 to 3 percent. If the PAT shows that there

are 97 percent seropositive individuals at the site, only isolated cases of measles are recorded, without further spread of infection.

The data obtained at infection sites enabled us to conclude that 97 percent individuals who are seropositive according to the PAT should be considered the "threshold" level of the stratum immune to measles, which prevents epidemic spread of infection in the group.

In addition, it has been shown that, when working in measles infection sites at the present time, there is increase in the role of clinical observations, which should be directed not only toward early detection of measles cases, but determination of the form of measles in a patient and severity of his catarrhal symptoms of the disease. These data are essential to determination of the scope of preventive and epidemic-control measures carried out among contacts of the measles patient, as well as forecasting the morbidity rate.

In assessing the efficacy of the set of preventive and epidemic-control steps taken at the present time to eradicate measles outbreaks, it should be noted that a differentiated approach is possible when measles is brought into groups of schoolchildren.

Thus, in the lower grades, where instances of bring in measles are most often limited to isolated cases of the disease under the effect of annual LMV revaccination of children 6-7 years of age, the preventive steps at the site of infection can be reduced to only prompt detection and isolation of measles cases from the group.

When a site of measles infection crops up in middle and higher school grades, it is desirable to expand the scope of measures, applying mainly measures aimed at raising the level of the actually immune stratum among the patient's contacts.

In summary, it should be concluded that, at the present stage, it is desirable to break regions down into rayons in accordance with the proposed criteria, in view of the substantial differences in measles morbidity indicators in different territories of the RF.

Territories with a morbidity rate of less than 10/100,000 population with stable high coverage of children up to 2 years old (at least 90 percent) with vaccinations, as well as with an insignificant number of individuals who are seronegative to the measles virus (no more than 7 percent) among children over 7 years old, should be classified as being in a good condition. For oblasts and rayons with higher morbidity rates, it is imperative to implement a set of additional measures aimed at raising the level of coverage with measles vaccination for children up to 2 years old, as well as increasing the stratum that is immune to measles in high risk groups and newly formed adolescent groups. Immediate epidemic-control measures when the first measles case appears at the infection site, as well as greater attention of physicians to early and differential diagnosis of measles, are important.

These steps, carried out within the framework of epidemiological surveillance of the infection, will stabilize measles morbidity rates in each territory of the RF and will bring us closer to solving the problem of eliminating measles from Russia.

#### References

1. Ignatyeva, G. V., Gerasimova, A. G., Kuznetsova, L. S., et al., "Immunoprofilaktika detskikh kapelnykh i kishhechnykh infektsiy" [Immunoprophylaxis of Childhood Droplet and Intestinal Infections], Moscow, 1987, pp 32-37.
2. Ignatyeva, G. V., Gerasimova, A. G., Sadykova, D. K., et al., "Vserossiyskiy syezd mikrobiologov, epidemiologov i parazitologov, 6-y: Tezisy dokladov" [Sixth All-Russian Congress of Microbiologists, Epidemiologists and Parasitologists. Summaries of Papers], Moscow, 1991, Vol. 2, p 177.
3. Rykushin, Yu. P., and Malykhina, R. M., "Detskiye virusnyye infektsii" [Childhood Viral Infections], Leningrad, 1979, pp 26-32.
4. Sadykova, D. K., "Means of Enhancing Efficacy of Vaccination Against Measles," candidatorial dissertation, Moscow, 1991.
5. Titova, N. S., Bolotovskiy, V. M., Mayskaya, L. M., et al., "Epidemiologiya, diagnostika i profilaktika infektsionnykh bolezney" [Epidemiology, Diagnosis and Prevention of Infectious Diseases], Kishinev, 1982, pp 66-67.
6. Combie, S. C., Worrell, R. D., Porter, B. M., et al., PUBL. HLTH. REP., 1988, Vol. 103, No 2, pp 162-166.

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#### Study of Anti-Tumor Activity of Preparations Deposited in a Polymer Matrix

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[Article by N. A. Petrusha, M. V. Grigoryeva, L. V. Rakhlevskiy, G. A. Pkhakadze, N. V. Morgart, and G. I. Kulik; Institute of Experimental Pathology, Oncology, and Radiobiology imeni R. Ye. Kavetskiy, Ukrainian Academy of Sciences, Kiev; Institute of Organic Chemistry, Ukrainian Academy of Sciences, Kiev; UDC 541.64:541.128.12:678.664]

[Abstract] In this work, the anti-tumor activity of drugs deposited in a polymer matrix was studied in animals with tumors. It was established that cytosar, immobilized in a polymer matrix of molecular weight 4500 Da at a dose of 160 mg/kg and a concentration of 70 mg/g, exhibited a maximum anti-tumor effect when injected into animals with transplanted L 1210 leukemia. Carcinomycin, cyclophosphane, and florafur, on the other hand, did not have such an effect when deposited in the polymer matrix and injected into animals with transplanted Gueren carcinoma, Walker carcinosarcoma, hepatoma 27, melanoma B 16, or P 388 leukemia. Figures 2; references 5: 4 Russian, 1 Western.



### New Immunosorbent for Purifying Interferon

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11 Nov 92) pp 738-739

[Article by M. I. Garipova, I. A. Baschenko, I. S. Frolova, O. B. Kleyeva, and V. P. Kuznetsov; presented by Academician G. A. Tolstikovyy 11 Nov 92; Institute of Organic Chemistry, Urals Department, Russian Academy of Sciences, Ufa; Scientific Research Institute of Epidemiology and Microbiology imeni N. F. Gama-leya, Russian Academy of Medical Sciences, Moscow; UDC 615.37:578.245.4:57.083.3]

[Abstract] Recently, various affinity sorbents with group specificity (based on heparin and lectins), as well as immunoaffinity sorbents (IAS), have been used to purify interferon. In this work, data on utilizing a new, mechanically and chemically resistant matrix, produced from polyvinyl alcohol (PVA), in the preparation of IAS are presented. The PVA carrier consists of active aldehyde groups at  $\geq 40 \mu\text{mol/ml}$  and can be used to immobilize amino-containing compounds. Use of the PVA carrier as an IAS matrix allows one to increase significantly the efficiency of purifying interferon preparations of allergen impurities and to reduce the risk of contaminating the preparation with rabbit immunoglobulin fragments. Due to the principles of gel formation and its activation, the carrier utilized by the authors combines two properties that are important for an affinity matrix intended for industrial use—large pore size (the gel is permeable to molecules of  $> 10^6$  Da) and strength. The PVA carrier is recommended for immobilizing ligands with the goal of producing affinity sorbents suitable for use in modern large-scale biotechnological production. References 6: 2 Russian, 4 Western.

### Paradoxical Toxic Effect and Calcium Antagonism of O-(N-Arylcarbamoyl) Acylhydroxymoyl Chloride Inhibitors of Cholinesterase

937C0327B Moscow DOKLADY AKADEMII NAUK  
in Russian Vol. 328 No. 6, Feb 93 (manuscript received  
5 Nov 92) pp 744-746

[Article by Yu. Ya. Ivanov, V. B. Sokolov, T. A. Yepishina, and I. V. Martynov (corresponding member of the Russian Academy of Sciences); Institute of Physiologically Active Substances, Russian Academy of Sciences, Chernogolovka, Moscow Oblast; UDC 615.015.12.43:577.152.311:57.042.2]

[Abstract] In studies of the physiological activity of O-carbamoyl acylhydroxymoyl chlorides, the authors found that compounds containing a phenyl substituent at the carbamate nitrogen atom had relatively low acute toxicity regardless of their high anti-acetylcholinesterase activity. Because low-toxicity compounds are of interest as potential pesticides and medicines, it was important to identify the reason for this incongruity. The authors synthesized N-phenylcarbamates and aliphatic analogues of the formula  $\text{RR}'\text{NC}(\text{O})\text{N}=\text{C}(\text{Cl})\text{R}^2$ , where

$\text{R}=\text{Et, Me, Ph; R}'=\text{H, Me; R}^2=\text{Et, Pr, }i\text{-Pr}$ , and determined their activity in inhibiting acetylcholinesterase (ACE) and butyrylcholinesterase (BuCE) and their acute toxicity and effect on isolated organs. The authors found that compound VIII ( $\text{R}=\text{Ph, R}'=\text{Me, R}^2=i\text{-Pr}$ ) exhibited both anti-ACE and anti-calcium effects. At low concentrations, the anti-ACE activity was close to that predicted by the  $k_{11}$  value ( $\text{M}^{-1}\text{min}^{-1}$ ), but at high concentrations, the anti-ACE activity dropped. The authors hypothesized that at high concentrations, anti-ACE compounds with calcium blocking activity would be less toxic than predicted because the "medicinal" (anti-calcium) mechanism would be superimposed over the damaging (anti-ACE) mechanism of activity. They encouraged further research of these compounds in an effort to improve the selectivity and to reduce the toxicity of pesticides and drugs to man and animals. Figures 2; references 11: 4 Russian, 7 Western.

## MEDICINE AND PUBLIC HEALTH

### Variability of Rate of Chromosomal Aberrations Induced by Man-Caused Pollutants in *Mus Musculus Wagneri* From Gissar Valley

947C0162A Yekaterinburg EKOLOGIYA in Russian  
No 1, Jan-Feb 93 pp 62-70

[Article by E.A. Gileva, N.L. Kosareva, N.M. Lyubash-evskiy, M.F. Bakhtiyarova, Plant and Animal Ecology Institute at the Urals Department of Russia's Academy of Sciences; UDC 576.356.2+504.3.054+599.323.4]

[Abstract] The difficulty of extrapolating most findings of chemical mutagenesis studies carried out on laboratory animals under strict controlled conditions and the advantages of cytogenetic studies on native rodents prompted an investigation into the level of cytogenetic impairments in the bone marrow of wild house mice near the Tadjik aluminum smelter in the Gissar valley. The mice were trapped along irrigation canal banks among rice paddies in two locations: 1 km from the smelter and 80 km from the plant on the leeward side. Two other man-caused contamination sources are identified in the study: pesticides and auto emissions. The experimental procedure is outlined. The rate of various types of chromosomal aberrations in the bone marrow of house mice, compound estimates of the cytogenetic impairment rate in the house mice bone marrow, and the variability of the rate of cytogenetic impairments in the bone marrow of *Mus musculus wagneri* are summarized. An analysis shows that the frequency of cytogenetic impairments in the bone marrow cells of mice caught in the Gissar valley noticeably exceeds spontaneous rates, leading to speculations that there is an elevated genetic risk to humans living in the area; furthermore, the mice



belonging to the same subpopulation display an individual rate variability of chromosomal aberrations induced by pollutants. It is demonstrated that house mice can serve as a good indicator for identifying man-caused contamination with a mutagenic effect. Tables 3; references 19: 4 Russian, 15 Western.

#### **On Some Factors of Nephrolithiasis Development Risk in Aral Sea Coast Region**

947C0186A Moscow *UROLOGIYA I NEFROLOGIYA* in Russian No 4, Jul-Aug 93 pp 19-21

[Article by V.S. Ryabinskiy, E. Doschanov, V.G. Ignatyev, Central Physicians Advanced Training Institute at the Russian Federation Ministry of Public Health, Moscow; UDC 616.62-003.7-02-07]

[Abstract] The drying-up of the Aral Sea which upset the ecological balance in the coastal regions and led to the development of such diseases as urolithiasis necessitated an investigation into the effect of environmental factors in the Aral ecological catastrophe area on the risk of nephrolithiasis development in the region. To this end, the organic acid concentration in the urine of patients was measured by gaseous chromatography-mass-spectrometry using a Hewlett Packard HP-M-5985 system, the concentration of macro- and trace elements in the blood and urine was measured by absorption plasma spectrophotometry and ion exchange chromatography, and the leucine amino peptidase and leucine arylamidase activity was determined using Fermognost and Monotest equipment (Germany). Altogether, 18 nephrolithiasis patients divided into three groups on the basis of environmental zones were examined. The environmental factors were assessed on the basis of data from reports of the Central Asian Irrigation Research Institute, Khorezm oblast sanitary and epidemiological station data, and reports from the Kara-Kalpak republican sanitary and epidemiological station. The proportion of such disease indices as clinical course, environmental zone, urine pH, etc., are summarized. The study reveals a moderate and moderate-to-high risk of developing urolithiasis in 26% of patients in zone I (most remote from the Aral Sea), 28.5% in zone II, and 42.5% in zone III (in direct proximity to the former sea), which is consistent with the existing concept of the role of environmental factors. Tables 1.

#### **Course of Chronic Noncalculous Cholecystitis in Residents of Belarus's Chernobyl Zone**

947C0164A Minsk *ZDRAVOOKHRANENIYE BELARUSI* in Russian No 7, Jul 93 pp 4-6

[Article by I.I. Goncharik, Scientific Research Institute of Radiation Medicine at the Belarus Republic Ministry of Public Health; UDC 616.366-002-036.12(476)]

[Abstract] The increasing incidence of bile duct inflammation against the backdrop of the psychological and emotional stress inflicted by the Chernobyl nuclear

power plant accident prompted a study of the characteristic features and course of chronic noncalculous cholecystitis in persons residing in the radionuclide-contaminated territory around the plant. To this end, 392 patients from Gomel and Mogilev oblasts aged 16 to 64 were examined; of these, 64% were under 40, and women dominated all age groups (73% overall). The control group included 78 patients of the same age from Minsk. The symptoms were analyzed in detail, and the efficacy of treatment was taken into account; computer-aided tomography was conducted in some cases. The findings show that chronic noncalculous cholecystitis is rather rare (24% of the cases) among adult residents of the contaminated regions and is observed as an isolated disease only among the young. The typical form of disease was less frequent in the target group while 212 patients displayed an intermittent course of the disease; atypical forms of chronic noncalculous cholecystitis were recorded in 100 persons or 28% of the patients vs. 14% in the control group, i.e., twice as frequently. These include cardiac, arthritic, subfebrile, neurasthenic, diencephalic, and allergic syndromes. Diagnoses were based on a careful and sound clinical examination. References 6.

#### **On Assessment of Radiological Conditions in Vitebsk Oblast**

947C0164B Minsk *ZDRAVOOKHRANENIYE BELARUSI* in Russian No 7, Jul 93 pp 7-9

[Article by L.M. Kirillov, V.V. Ivanovskiy, N.F. Kurilenko, S.V. Zhavoronok, V.N. Tarasevich, Vitebsk Branch of the Belarussian Scientific Research Institute of Radiation Medicine; UDC 614.73:364.26(476.5)]

[Abstract] Data from a perennial study of the radionuclide concentration in mushrooms, plants, and meat and dairy products in Vitebsk oblast are cited, and an attempt is made to identify the trends of changes occurring in the ecosystem for use as an environmental monitoring parameter. To this end, the  $^{134}\text{Cs}+^{137}\text{Cs}$ ,  $^{60}\text{Co}$ , and  $^{40}\text{K}$  concentration in *Morchella esculenta* and other mushrooms, cabbage, potato, carrots, tomatoes, beans, onions, and radish procured in 1991 and in muscle and osseous tissue of elk and wild boar in Vitebsk oblast (in Bq/kg) are summarized, and the likely oral intake of radionuclides by humans with wild meat is calculated. The findings confirm the radionuclide fallout in Vitebsk oblast in the aftermath of the Chernobyl accident and show that the internal population irradiation dose due to vegetable and plant consumption in the oblast has decreased and stabilized while the level attributable to wild meat consumption continues to fluctuate. The editors of the journal note, however, that the findings for  $^{60}\text{Co}$  are not consistent with their data and that no sanitary standards are cited for the above vegetables, dairy, and meat products. Tables 3; references 7.

**Respiratory Diseases in Infants Living in Radionuclide-Contaminated Regions**

947C0164C Minsk ZDRAVOOKHRANENIYE  
BELARUSI in Russian No 7, Jul 93 pp 10-12

[Article by A.M. Petrova, M.M. Zafranskaya, Belarusian Scientific Research Institute of Motherhood and Childhood Protection; UDC 616.988-053.36(476)]

[Abstract] The effect of chronic low radiation doses on infants born in contaminated territories in the aftermath of the Chernobyl accident against the background of the infant organism's immunological reactivity, reports of immunodeficiency among infants due to an increased incidence of pathological pregnancy course in the contaminated territories, and a lack of reliable data on the respiratory morbidity among infants residing in contaminated regions prompted retrospective and comparative analyses of the incidence of acute respiratory infection in infants (under one year old) living in contaminated rayons of Mogilev and Gomel oblast. Statistical data processing was carried out on a CASPER computer using Fisher's angular transform method and empirical series approximation. Bykhov, Kostyukovich, Krasnopol, Slavgorod, Cherikov, and Klimovich rayons of Mogilev oblast and Bragino, Narovlyansk, Dobrush, Chechery, Lelchitsi, Yelsk, Khoyniki, Vetkovo, Buda-Koshelev, and Loyev rayons of Gomel oblast were examined; Goretskiy and Oktyabrskiy rayons, respectively, were used as "clean" control areas. The study covers 1985-1990. The rates of respiratory infection in infants in various rayons are plotted, and the respiratory disease indices (per 10,000 population) are summarized. The study reveals a significant rise in the respiratory pathology level in most regions where soil contamination with  $^{137}\text{Cs}$  exceeds 5 Ci/km<sup>2</sup>. The need for further epidemiological studies, mass immune system examinations, and preventive measures is stressed. Figures 3; tables 1; references 8.

**Efficacy of Intraoperative Enterosorption by Polysorb in Lowering Postoperative Peritoneal Intoxication and Infection**

947C0164D Minsk ZDRAVOOKHRANENIYE  
BELARUSI in Russian No 7, Jul 93 pp 51-55

[Article by P.K. Zagniboroda, A.A. Zaporozhets, N.B. Lutsyuk, Functional System Physiology Laboratory of the Physiology Institute at the Belarusian Republic Academy of Sciences and Vinnitsa Medical Institute imeni N.I. Pirogov; UDC 616.381-022.1-089.168.1:615.246.2+615.38].015.2]

[Abstract] A scarcity of data on the permeability of enteric sutures to products from the gastroenteric tract and the effect of the toxic substances penetrating the abdominal cavity on the development of intoxication as

well as the shortage of effective sorbents and application methods necessitated a detailed study of these issues. To this end, the properties of polysorb—a new enterosorbent—are examined *in vitro* and on laboratory animals with 68 adult 8-18 kg dogs (of both sexes) and 12 adult rats using models of 3-hour occlusion and 12-hour strangulation ileus. The medium molecule level in the blood serum was used as the intoxication criterion. The study shows that toxic substance penetration from the lumen to the abdominal cavity through the sutures has a significant impact on the development of postoperative intoxication and confirms the efficacy of the new sorbent. The enterosorption method was successfully tested clinically in surgery wards of the Vinnitsa regional clinical hospital and implemented in Kiev, Moscow, Khmel'nitskiy, and Andizhan. Compared to traditional acute ileum treatment practices, the new method tested on 287 patients lowered mortality by 11.4% and shortened hospital stay or ambulatory treatment by 5-7 days with an accompanying reduction in the recovery period. Figures 2; references 8.

**Metabolic Characteristics of Children With Elevated Intakes of Cesium and Strontium Radionuclides**

947C0189A Minsk ZDRAVOOKHRANENIYE  
BELARUSI in Russian No.10, 1993 (manuscript received 05 May 93) pp 4-8

[Article by L.N. Astakhova, F.N. Solodovnikova, L.P. Loseva and L.V. Tkachenko, Clinic, Scientific Research Institute of Radiation Medicine, Belarusian Ministry of Health; UDC 577.115/.121-059-07:612.014.482]

[Abstract] Metabolic monitoring was performed on 20 children, boys and girls 8-12 years old, in the Brest Oblast exposed to elevated background levels of Cs and Sr radionuclides. Urinary levels of Cs ranged from 20 to 400 Bq/L and of Sr from 0.003 to 0.3 Bq/L; 18 of the children presented with euthyroid hyperplasia, 15 with generalized gastrointestinal disorders, and 6 with chronic gastritis in remission. Clinical chemistries revealed positive, significant (p) dialdehyde and plasma and erythrocyte levels of lipid peroxides and urinary Sr and Cs concentrations. The patient cohort also presented with depressed erythrocyte catalase (p) activities. In conjunction with other factors reflecting energy metabolism, the findings were consistent with an interpretation that increased exposure to the radionuclides entailed activation of lipid peroxidation and compromised antioxidant mechanisms. Accordingly, therapeutic measures in such at-risk children should be directed at stimulation of tissue respiration, correction of acidotic shifts and control of lipid peroxidation to alleviate cell membrane damage. Tables 2; references 6: 5 Russian, 1 Western.

**Novel Approach to Periodic Medical Screening**

947C0189B Minsk ZDRAVOOKHRANENIYE  
BELARUSI in Russian No. 10, 1993 (manuscript  
received 05 May 93) pp 60-63

[Article by V.G. Zhukovskiy, K.S. Lyashenko and A.V. Rakevich, Republic Center for Hygiene and Epidemiology, Ministry of Health, Belarus; UDC 613.62-084]

[Abstract] There is reason to doubt the accuracy of data on occupational diseases in Belarus because of the rather random and irregular screening programs. Available data have shown that years of exposure to a given factor may be required before frank pathology can be discerned, and then only if a system of regular examinations are scheduled. The screening system in Belarus has to be improved to discern premorbid states well in advance of disease onset, which means implementing regular medical examinations. Once regular screenings have been implemented, the time of appearance of a premorbid condition may be regarded as a temporal exposure limit for a given risk factor. References 15 (Russian).

**Development of Methodology, Algorithms, and Software for Monitoring and Controlling Region's Environmental Conditions**

947C0138A Rostov-na-Donu IZVESTIYA SEVERO-KAVKAZSKOGO NAUCHNOGO TSENTRA VYSSHEY SHKOLY in Russian No 3-4(78-79), Jul-Dec 92 pp 7-13

[Article by N.N. Lybakh, E.S. Sobol, Rostov Railroad Transport Engineering Institute; UDC 504.064.3:621.311.22]

[Abstract] The shortcomings of the existing approach to analyzing the environmental conditions and controlling them at a number of large enterprises in the regions which led to closing down or imposing restriction on numerous chemical, pharmaceutical, and metallurgical facilities (which fail to comply with atmospheric and water discharge guidelines) made it necessary to speed up the research efforts and prompted the development of algorithms and software for developing environmental monitoring and control systems at entities under the USSR Chemical Industry Ministry jurisdiction. The program of efforts developed by the Khimavtomatika Scientific Production Association calls for setting up environmental monitoring, developing process control systems allowing for environmental criteria, and developing decision-making systems (environmental data collection and processing) at all management levels, including regional, republican, and national. In essence, the task amounts to formulating legitimate values of process control and environmental protection criteria and minimizing them, determining the areas of their intersection, finding the characteristic enterprise operating conditions, and determining the boundary values of criteria which cannot be exceeded. The feasible operating domains with respect to both sets of criteria are plotted, and reference operating conditions are formulated. The proposed approach to controlling the region's environmental conditions takes into account both sets of criteria while the algorithms and software which

determine the solution of the formulated problem remain valid with some degree of uncertainty in the initial data. Figures 3; references 8.

**Outcome of Environmental Expedition to Examine Taganrog Bay Water Area**

947C0138B Rostov-na-Donu IZVESTIYA SEVERO-KAVKAZSKOGO NAUCHNOGO TSENTRA VYSSHEY SHKOLY in Russian No 3-4(78-79), Jul-Dec 92 pp 13-15

[Article by K.Ye. Rumyantsev, Taganrog Radio Engineering Institute; UDC 621.396.62:551.521]

[Abstract] The development of principally new and efficient remote and contact instruments for detecting and mapping the water area contamination by the Taganrog Radio Engineering Institute (TRTI) facilitated the study of the environmental conditions in the Taganrog bay of the Sea of Azov using two vessels with a 2.5 m draught and made it possible to take measurements in the port of Taganrog, in the area of a collector near the village of Dmitriadovka, in the Andreyev bay, and in the Don river flood plain and to take samples 300 m from the coast line. The specific features of the instruments used for monitoring the aqueous ecosystem parameters and their uses are outlined. A radar complex for determining the wave parameters and detecting sea surface irregularities based on measuring the echo signal strength and Doppler characteristics is described. The equipment operating in the 3 cm band was developed under the leadership of Prof. A.A. Garnakeryan. A chart of the investigated region is shown, and echo signal recordings are plotted. Radar complex tests confirm the possibility of upgrading off-the-shelf aircraft equipment used for measuring the wave parameters for remote detection of water surface contamination. The use of a laser-based water surface pollution recorder demonstrates the possibility of using it not only for detecting but also for classifying petroleum product fractions. The findings confirm the possibility of developing temperature sensors and pressure transducers on the basis of ion selective electrodes for on-line environmental assessment; it is speculated that the results may serve as the basis for developing a shipborne research lab. Figures 2.

**Negatron Analogue-Based Microelectronic Smoke- and Temperature-to-Frequency Converters**

947C0138C Rostov-na-Donu IZVESTIYA SEVERO-KAVKAZSKOGO NAUCHNOGO TSENTRA VYSSHEY SHKOLY in Russian No 3-4(78-79), Jul-Dec 92 pp 40-43

[Article by K.Ye. Rumyantsev, O.N. Negodenko, Taganrog Radio Engineering Institute; UDC 621.373.5]

[Abstract] The shortcomings of known negatron analogues, i.e., the low output voltage and the fact that the load resistor also serves as one of the resistors whose resistance reverses to negative, leading to a considerable effect of the subsequent stage's resistance on negative resistance, i.e., affects the oscillator stability, prompted the development of microelectronic negatron analogue-based smoke and temperature sensors with a frequency



output. Schematic diagrams of the sensor resistance-to-frequency converters with two current repellers with transparent transistor pairs are cited, and the dependence of the converters' frequency on temperature at various capacitance values is plotted. In the smoke detector, one resistor is substituted with an FD 256 photodiode upon which radiation from an AL 107 light emitting diode is incident at a 45° angle. The appearance of smoke leads to a 5-10% change in the pulse repetition frequency. Both converters may also be used in illuminance and magnetic field sensors which can be easily realized using integrated circuits. Figures 3; references 2: 1 Russian, 1 Western.

#### **Environmental Sensor Circuit Design With Piezoelectric Vibrators**

947C0138D Rostov-na-Donu IZVESTIYA  
SEVERO-KAVKAZSKOGO NAUCHNOGO TSENTRA  
VYSSHEY SHKOLY in Russian No 3-4(78-79),  
Jul-Dec 92 pp 43-45

[Article by O.N. Negodenko, S.I. Lipko, L.A. Zinchenko, V.G. Prokopenko, Taganrog Radio Engineering Institute; UDC 621.3.011.212]

[Abstract] The characteristic features of moisture and toxic gas sensors employing quartz crystal vibrators using both surface and bulk acoustic waves and the principal requirements (primarily the absence of active elements in order to realize the designs on the basis of microelectronics methods) imposed on such detectors are discussed; it is noted that negatron analog-based oscillators with an S-shaped voltage-current characteristic shifted along the current axis meet these requirements the best way. When power supply voltage is applied, the operating point between the terminals to which the piezoelectric vibrator is connected settles in the area of negative incremental resistance. Oscillations are generated in the circuit when the negative resistance is sufficient to offset the positive resistance which reflects electric power losses in the vibrator. Schematic diagrams of negatron analogues and a schematic diagram of a negatron analogue-based sensor are cited and the relative advantages and shortcomings of eight negatron designs are evaluated. Figures 2; references 3: 2 Russian, 1 Western.

#### **Impact Radiation Contamination Monitoring**

947C0138E Rostov-na-Donu IZVESTIYA  
SEVERO-KAVKAZSKOGO NAUCHNOGO TSENTRA  
VYSSHEY SHKOLY in Russian No 3-4(78-79),  
Jul-Dec 92 pp 46-49

[Article by K.Ye. Rumyantsev, Yu.K. Afanasyev, Taganrog Radio Engineering Institute; UDC 535.374.554.455]

[Abstract] The constantly increasing volume of man-made substances which enter the environment and the rising scale of discharges which contaminate the soil, air, and water increase the urgency of impact environmental

pollution monitoring which provides the necessary data for managing the environment. The need for continuous impact monitoring rather than sporadic spot checks in order to make it possible to automate the radiation condition monitoring and, most importantly, predict its course so as to make timely decisions prompted the development of an impact monitoring program whereby the accuracy rating of the sensors, counters, and radiometers may be relatively low. The radiation measurement carried out in the framework of this program in Taganrog are outlined, and a block diagram of the universal activity and dosage rate meter used for this purpose is cited. The device contains SBM-20 (gamma) and SBT-10A (beta) detectors, a signaling system consisting of an acoustic signal triggering circuit and a digital display, an instrument circuit, and a liquid crystal cumulative dose indicator. The operating principle of the system is described in detail, and a formula is proposed for calculating the equivalent radiation dose rate. Proximate monitoring data show that the radiation dosage rate over the entire city territory (outside the enterprises) does not exceed 0.18  $\mu\text{Sv/h}$  which is less than one-third of the maximum permissible safe standards. The absence of abnormal radioactive contamination made it possible to skip  $\beta$ -radiation measurement.

#### **Laser-Based Detector of Water Contamination With Petroleum Products**

947C0138G Rostov-na-Donu IZVESTIYA  
SEVERO-KAVKAZSKOGO NAUCHNOGO TSENTRA  
VYSSHEY SHKOLY in Russian No 3-4(78-79),  
Jul-Dec 92 pp 53-55

[Article by K.Ye. Rumyantsev, Yu.K. Afanasyev, Taganrog Radio Engineering Institute; UDC 535.375.551.463]

[Abstract] The issue of developing hardware for remote monitoring of the hydrosphere and obtaining real-time data on the state of the water surface, the suspension-bearing flow turbidity, and the presence of certain substances in the liquid or bottom sediments is addressed, and attention is given to the problem of water surface contamination with petroleum and refining products. The advantages of a laser-based petroleum contamination detector are outlined, and it is noted that it is capable of continuously monitoring the discharges from industrial enterprises, obtaining real-time data, providing information about the petroleum product contamination at any time of day or year, detecting water pollution at the discharge stage, transmitting data from the collection point, and storing and retrieving data at any moment using a computer. The laser detector is designed on the basis of a He-Ne laser and contains a power supply unit, a prism, receiving optics, a photodetector, a data processing module, and a rapid process analyzer. A petroleum product detector block diagram is cited and the results of its testing are summarized. Both stationary (installed at an automatic monitoring station (ASK)) and aircraft- or satellite-borne detector versions can be made. Its use on a space vehicle makes it possible to inspect vast water areas over a relatively short time interval. A stationary detector makes it possible to detect



and analyze water surface contamination at the discharge stage, i.e., soon after dumping, when cleanup is still simple and inexpensive. The operating principle of both types of detectors is outlined. Figures 1; tables 1; references 4.

### Effect of CO<sub>2</sub> on Electric Characteristics of Polycrystalline Silicon Films

947C0138F Rostov-na-Donu IZVESTIYA SEVERO-KAVKAZSKOGO NAUCHNOGO TSENTRA VYSSHEY SHKOLY in Russian No 3-4(78-79), Jul-Dec 92 pp 49-52

[Article by F.D. Kasimov, O.N. Negodenko, V.M. Mamikonova, S.N. Ragimov, Taganrog Radio Engineering Institute; UDC 621.316.826:533.275.08]

[Abstract] The steadily deteriorating environmental conditions increase the urgency of examining the gas composition of the environment, particularly with the help of electrophysical and semiconductor gas analyzers which use porous ceramics or semiconductor polycrystalline films as gas sensors. With respect to the foregoing, the behavior of the electric parameters of poly-Si (PK) films under the effect of carbon dioxide is investigated, and the issues of detecting and automatically monitoring the CO<sub>2</sub> concentration is addressed. This is especially important for closed rooms with a large number of people, e.g., subways. The polycrystalline silicon film production process employing seed layers and epitaxial growth of single crystal films is outlined in detail, and a schematic diagram of a poly-Si film-based sensor is cited. The voltage-current characteristics of the sensor in normal atmosphere and in a CO<sub>2</sub> medium with normal and inverse polarity and the dependence of the voltage developing in the short arm of the sensor on the relative carbon dioxide concentration at a varying voltage in the long arm are plotted. An increase in the sensor's output voltage with an increase in the gas concentration is attributed to the mechanism of elevated impurity conduction developed by the adsorbed donor CO<sub>2</sub> molecules. The sensitivity of this process increases when constant bias is applied to the perpendicular arm due to the lowering of the potential barrier of the grain boundaries. Thus, the proposed structure is characterized by the output signal modulation from one arm to the other which may be regarded as adsorption field effect. Figures 3; references 6: 1 Russian, 5 Western.

### Silicon MIS Structure-Based Hydrogen-Sensitive Element

947C0138H Rostov-na-Donu IZVESTIYA SEVERO-KAVKAZSKOGO NAUCHNOGO TSENTRA VYSSHEY SHKOLY in Russian No 3-4(78-79), Jul-Dec 92 pp 55-58

[Article by N.A. Babayev, M.A. Bagirov, G.A. Imanguliyev, N.F. Kazymov, F.F. Kasimova, S.N. Ragimov, Scientific Production Association of Space Research at the USSR Main Space Administration; UDC 621.316.826:533.275.08]

[Abstract] Successful application of metal-insulator-semiconductor (MDP) structures with various gas permeable gate electrodes whose gas sensitivity is due to several interrelated successive mechanisms are discussed, and it is noted that the existing model does not take into account possible hydrogen atom interpenetration in the insulator, creating certain difficulties in interpreting experimental data. Consequently, integral hydrogen sensors which contain a gas sensitive MIS capacitor, a diffusion resistor-heater for ensuring the necessary constant temperature, and a temperature measuring diode is examined. The sensor utilizes p-Si(100) element with a 10 Ω cm resistivity; ≈ 700 angstrom insulator layers are produced by thermal oxidation in an atmosphere of dry oxygen. The structure's radio frequency volt-farad characteristics without and with hydrogen (200 ppm), the energy distribution of the surface state density, and the output response of the MOS transistor with an n-channel are plotted. The C-V curves are recorded by a universal E7-11 bridge at room temperature. The surface state density redistribution on the insulator-semiconductor interface noticeably affects the detection process whereby the energy interval of the surface stage range determines the bias voltage sensitivity range of the MOS structure. The findings can make a contribution to developing a physical model of gas sensitive MIS structures. Figures 3; references 6: 2 Russian, 4 Western.

### Biomedical Studies of the Health Status of Moscow Children in Rayons With Different Levels of Atmospheric Air Pollution

947C0150A Moscow GIGIYENA I SANITARIYA in Russian Vol. 58 No. 8, Aug 93 (manuscript received 10 Mar 92) pp 52-55

[Article by T.I. Bonashevskaya, Yu.N. Molkov, E.A. Yureva, G.V. Plaksina, I.M. Makeyeva, A.N. Shibanov, V.V. Vasilenko, and A.V. Chichev, Human Ecology and Environmental Hygiene Scientific Research Institute imeni A.N. Sytin, Russian Academy of Medical Sciences, Moscow, Preventive Medicine Center, Moscow, Pediatrics and Pediatric Surgery Institute, Russian Federation Ministry of Health, Moscow, Moscow Oblast Scientific Research Clinical Institute imeni M.F. Vladimirovskiy, Russian Federation Ministry of Health, Moscow Medical Stomatology Institute imeni N.A. Semashko, Medical Technology Scientific Research and Testing Institute, Moscow, Central Physicians Advanced Training Institute, Moscow, and Moscow Agricultural Academy imeni K.A. Timiryazev; UDC 614.72(470.311-25):616-053.2]

[Abstract] Studies of the health status of children in three microrayons of Moscow have established the presence of a number of diseases of the otorhinolaryngological organs, allergopathies, adenosinorhinopathies, and central nervous system impairments that are all more prevalent in areas with higher levels of atmospheric air pollution. The studies have further confirmed that the higher morbidity in regions with elevated air pollution levels is due to weakening of the body's nonspecific resistance, as indicated by the microflora content and status of the antibacterial

defense system (including its humoral and cellular components) in available biological material. Children from rayons with elevated pollution levels manifested an increased level of polymorphonuclear leukocytes [PMNL]. Specifically, the PMNL levels of children from the microrayons studied were as follows: Bauman-skiy, 20 percent; Krasnogvardeyskiy, 12 percent; and Gagarinskiy, 8 percent. The frequency of spontaneous and induced chemiluminescence of PMNL in the urine was as follows for children from the different rayons: Gagarinskiy, 0.5 and 1 percent; Krasnogvardeyskiy, 22 and 0 percent; and Sadovoye koltso (Bamanskiy rayon), 27 and 53 percent. Conventional cytologic and micro-biological studies to determine resistance based on the level of microflora established a link between lowered resistance and elevated pollution level. Asymptomatic bacteriuria (levels of colony-forming units of  $10^5$  to  $10^7$  and  $10^3$  to  $10^5$ ) were found in the different rayons with the following frequencies (percentage of cases): Gagarinskiy, 12 and 10.1; Krasnogvardeyskiy, 8.8 and 13.6; and Bauman-skiy, 10 and 21. The incidence of pathological forms of crystals in the urine and saliva also increased in the more highly polluted rayons. Studies of the lead level in the urine and nasal secretions of children of two kindergartens in the Bauman-skiy region revealed lead exposure levels far exceeding the existing norms. Seventy-two percent of children from kindergarten No 757 had urine levels exceeding the norm (0.022 mg/kg), and 100 percent had above-norm levels of lead in their nasal secretions. Of the children from kindergarten No 1411 who were studied, 76.9 percent had above-norm lead levels in their urine and only 37.5 percent had above-norm levels in their nasal secretions. A system of noninvasive bioscreening to assess the effect of the environment on children living in areas of elevated air pollution was outlined. Tables 2; references 4: 3 Russian, 1 Western.

#### Ophthalmologic Signs of Mobius' Syndrome

947C0181 Moscow VESTNIK OFTALMOLOGII  
in Russian Vol 109, No.5, Oct-Dec 93 [manuscript  
submitted 26 Feb 93] pp 30-31

[Article by I. I. Kalachev [deceased], A. Yu. Balarev,  
Department of Ophthalmology, Moscow Oblast Clinical  
Scientific Research Institute imeni M. F. Vladimirovskiy;  
UDC 616.742-009.11-008.6-036.1(048.8)]

[Abstract] If Mobius' syndrome—congenital paralysis of the facial muscles—is detected early enough, the prognosis is good. The doctors here report a case in which an unusual ophthalmic sign of the syndrome is demonstrated. A male child aged 1 year 6 months was hospitalized for surgery for entropion. Right after birth, the child had been diagnosed as having perinatal encephalopathy owing to the absence of the sucking reflex and the presence of strabismus convergens. Later, questionable signs of psychomotor retardation were noted. Neurological status included total amimia, signs of paralysis of the mimetic and chewing muscles, the sublingual nerves, and the abducent nerves on both sides. The lower eyelids

showed a second-degree entropion. The child blinked rarely. The diagnosis is unusual in that it represents the first time that congenital entropion has been observed in combination with facial diplegia. Figures 1, references 21: 4 Russian, 17 Western.

#### Pharmacological Correction of Learning and Memory Process Impairments Induced by Microwave Electromagnetic Radiation

947C0123A Moscow BYULLETEN  
EKSPERIMENTALNOY BIOLOGII I MEDITSINY  
in Russian Vol. CXV No. 3, Mar 93 pp 260-264

[Article by I.N. Krylov, V.V. Yasnetsov, A.S. Dukhanin,  
Yu.P. Paltsev, Pharmacology Department of the Biologi-  
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Russian Federation Public Health Ministry and Molec-  
ular Pharmacology and Radiobiology Department at the  
Russian State Medical University imeni N.I. Pirogov,  
Moscow; UDC 616.8-092:612.821.1/.3]-085.844]

[Abstract] The scarcity and contradictory nature of published data on the effect of microwave (SVCh) electro-magnetic radiation (EMI) on the learning and memory processes as well as the proliferation of microwave radiation in all fields of science and engineering necessitated a specific study of the neurochemical mechanisms underlying the learning and memory process impairment induced by nonthermal microwave radiation and attempts to correct these impairments by pharmacological means. To this end, an experiment is carried out on 180-200 g male Vistar rats which were trained in conditioned reaction of passive avoidance (URPI) after which they were immediately exposed to microwave irradiation on a 12.6 cm wavelength (2375 MHz) with a 1 mW/cm<sup>2</sup> power density for 1 h while constantly measuring the microwave radiation parameters. The experimental procedure is outlined. Control animals were exposed to false irradiation. The parameters of the specific binding by synaptic membranes of various rat brain sections are summarized. The behavioral study demonstrates that microwave irradiation induces retrograde amnesia in rats manifested by a drop in the number of animals maintaining correct task execution functions after irradiation. Naloxon, a universal blocker of opioid receptors, injected intraperitoneally in a 1 mg/kg dose 50 min prior to training and the ensuing irradiation session reliably ( $p < 0.05$ ) moderated the amnesia effect of microwave irradiation, making it possible to speculate that the endogenous opioid system plays an important role in the genesis of the retrograde amnesia induced by irradiation. *In vitro* studies using radioreceptor analysis show that the BD-receptor concentration in the cerebellum drops from 75 fmole/mg to 44 fmole/mg. The findings reveal that 100 and 10 mg/kg doses of piracetam and oxiracetam, respectively, prevent the development of the amnesic effect of radiation. The experiment thus confirms the efficacy of nootropic preparations as a means of pharmacological correction. Figures 1; tables 1; references 10: 4 Russian, 6 Western.

**Effect of Organometallic Immunomodulators on Sensitivity to Plague Toxin**

947C0123B Moscow BYULLETEN

EKSPERIMENTALNOY BIOLOGII I MEDITSINY  
in Russian Vol. CXV No. 3, Mar 93 pp 282-284

[Article by G.B. Kirillicheva, I.G. Baturina, K.K. Rozhkov, M.A. Ignatenko, Scientific Research Institute of Experimental Medicine imeni N.F. Gamaley at Russia's Academy of Medical Sciences, Moscow; UDC 615.275.2.015.4.07]

[Abstract] Increasing uses of immunomodulators (IM) for treatment of various pathological conditions and reports about their ability to alter the organism's sensitivity to various toxic factors prompted an investigation into the effect of immunomodulators with an organometallic origin to the plague microbe's mice toxin (MT) in various types of mice. Allowing for the fact that body sensitivity and resistance to the effect of various substances vary during the day, studies were conducted at different hours. In so doing, CBA, C57B1/6, and hybrid  $F_1$ (CBAxC57B1/6) male mice kept under normal conditions were examined. The rats were acclimated for two weeks after which MOP-35 and MOP-37 immunomodulators were injected intravenously at 1100 and 2300 h; an isotonic NaCl solution was administered to control animals. The mice toxin preparation was isolated and purified from the lysate of *Yersinia pestis* cells, and 5 min after intravenous injection of the immunomodulator, 0.5 and 1  $\mu$ g plague toxin doses were administered to the mice intraperitoneally. The behavior of the mice toxin sensitivity under the effect of immunomodulators in CBA mice at various times of day and the behavior of sensitivity to the mice toxin under the effect of immunomodulators in C57B1/6 and hybrid  $F_1$ (CBAxC57B1/6) mice at various times of day are plotted. The findings indicate a change in sensitivity to the mice toxin as early as 5 min after the immunomodulator injection while the dependence of the effect on the injection time attests to the apparently great contribution of the nonspecific protection mechanisms to the change in sensitivity to the toxin; the characteristic features of the daily hormone production schedule of the adrenal cortex may also play a certain role. This confirms that the above two organometallic immunomodulators can serve as a highly active means of quickly changing sensitivity to plague intoxication. At present, it does not seem possible fully to explain the findings; a comprehensive comparative study of the daily activity fluctuations of ecto-5'-nucleotidase (5'-N) peritoneal exudate macrophages (MPE) and the related neuroendocrine system indicators of various mice species may help to find the answer. Figures 2; references 10: 7 Russian, 3 Western.

**Natural Cytokine Complex in Treatment of Penetrating Rabbit Corneal Wounds in Experiment**

947C0123C Moscow BYULLETEN

EKSPERIMENTALNOY BIOLOGII I MEDITSINY  
in Russian Vol. CXV No. 3, Mar 93 pp 284-287

[Article by L.V. Kovalchuk, L.V. Gankovskaya, T.A. Kraynova, A.K. Mataipova, V.M. Manko, I.P. Khoroshilova-Maslova, Immunology Department at the Russian State Medical University, Immunology Institute at the Russian Federation Public Health Ministry, and Scientific Research Institute of Eye Diseases imeni Helmholtz, Moscow; UDC 617.713-001.45-092.9-08]

[Abstract] Published reports about the possibility of accelerating the regenerative processes in the damaged cornea under the effect of cytokins, particularly a combination of EGF and PDGF—alkaline and acidic fibroblast growth factors—which influences the retina cell proliferation more than each individual cytokine separately prompted a study of the effect of a complex of cytokins on regenerative processes in the corneal tissue. To this end, the effect of the cytokine complex and its fractions on the healing of penetrating rabbit corneal wounds is investigated. In so doing, blood is drawn from the rabbit's ear vein, and mononuclear cells are isolated by Boyum's method and cultivated in medium 199 with 100  $\mu$ g/ml of streptomycin and 100 units/ml of benzylpenicillin at a 5,000,000/ml cell concentration. The experimental procedure is outlined. The wound healing dynamics under treatment with a complex of cytokins and a phosphate-salt buffer solution and the wound healing dynamics under treatment with fraction of the cytokine complex and medium 199 with the above antibiotics are plotted, and the comparative role of the effect of the cytokine complex, its fractions, and control media on the cornea healing process is summarized. A certain retardation of the cicatrization process under the effect of cytokins in experimental animals is observed; this is attributed to the effect of cytokins at the early regenerative process period or a delay in fibrin resolution by macrophages under the effect of cytokins at the early regeneration stages. In general, a comparison shows that the cornea healing process is greatly accelerated, and photophobia and mucous discharge are eliminated in the first two days after the injury, while the scar tissue is much thinner, thus speeding up recovery of the cornea's natural curvature and translucence. It is speculated that exogenous administration of cytokins induces the production of immunopeptides by cells and normalizes the healing processes. Figures 3; tables 1; references 7: 3 Russian, 4 Western.



**Effect of Hydra Morphogen's Peptide Factor on Tissue Component Structure of Rat Myocardial Layers at Early Cardiac Hypertrophy Development Stages**

947C0123D Moscow BYULLETEN  
EKSPERIMENTALNOY BIOLOGII I MEDITSINY  
in Russian Vol. CXV No. 3, Mar 93 pp 307-309

[Article by V.A. Fedoseyev, A.N. Kazimirskiy, I.A. Ionina, Ye.B. Lomakina, A.Yu. Rubina, A.S. Pylayev, Morphology and Cytology Department of the Russian State Medical University; UDC 616.12-007.61-036.4-092.9-07]

[Abstract] Reports that the peptide factor isolated from sea anemones and known as the hydra head morphogen has been found in mammals, including humans, and the ability of the peptide hydra morphogen (PMG) to control the cell proliferation which fuel speculations that the peptide hydra morphogen is a peptide regulator which, while displaying no tissue specificity, is active in stimulating the developing or impaired function prompted a morphological examination of the effect of one-time synthetic peptide hydra morphogen injection on various layers of rat's hypertrophic myocardium. To this end, an experiment was carried out on nine 180-200 g male Vistar rats, and 1 ml of the peptide hydra morphogen synthesized at the experimental cardiology lab was diluted in a physiological solution and administered intraperitoneally at a 20 µg/kg dose. The experimental procedure is outlined. Statistical data are processed on a PC 1640 Amstrad computer using Student's t-test. Morphological indicators of the tissue components in various layers of the left ventricular myocardium under simple hypertrophy and hypertrophy under the effect of the peptide hydra morphogen, i.e., subendocardial, intramural, and subepicardial layers, are summarized. The study demonstrates that peptide hydra morphogen injection leads to a shrinkage of the modification zone in the subendocardial layer and a shift toward the ventricular cavity. The myocyte vacuolization is preserved but is manifested less markedly while the altered nuclei and overly contracted cardiomyocytes occur less frequently. Virtually no other structure distortion signs are found in other myocardial layers, and the subendocardial layer edema is less manifested than in amino acid control. Other layers do not display any edema features. A comparison of the relative capillary volume and surface in the subendocardial and intramural layers indicates an increase in the blood flow volume. The conclusion is drawn that one-time peptide hydra morphogen injection facilitates myocardial hypertrophy recovery mostly in the subendocardial layer but also in the subepicardial and intramural layers. The effect of the peptide hydra morphogen is manifested not only in the muscle and connective tissue but also the intramural vessel system, resulting in an intramural blood flow redistribution. Tables 1; references 12: 5 Russian, 7 Western.

**Increased Anti-Tumor Resistance in Mice by Means of Antigen Modification of Tumor Cells With RNA Preparations**

937C0351A Kiev EKSPERIMENTALNAYA  
ONKOLOGIYA in Russian Vol. 15 No. 3, May-Jun 93  
(manuscript received 5 May 92) pp 36-39

[Article by S. I. Ilitskaya and V. P. Nikolin; Institute of Cytology and Genetics, Siberian Department, Russian Academy of Sciences, Novosibirsk; UDC 616-006-097.3-02:615.267.4:547.963.32] [Abstract] Xenogenic, highly polymerized RNA was injected intraperitoneally into strain A/He mice with a syngenic tumor of the mammary gland (CMG). It was established that this led to a definite reduction in tumor growth only in conjunction with a preliminary immunization with CMG cells treated with RNA. In CC57BR strain mice, during syngenic transfer of Krebs-2 tumor cells from mice that had received rat RNA, tumor growth was suppressed in recipients that had been pre-immunized with Wistar rat spleen cells. It was proposed that alteration of tumor cell antigens was possible with parenteral injection of RNA, just as had been observed during RNA activity on cells *in vitro*. Figures 2; references 12: 8 Russian, 4 Western.

**Effect of Myeloid on the T-System of Immunity and Development of Transplantable Melanoma B16 in C57BL/6 Strain Mice**

937C0351C Kiev EKSPERIMENTALNAYA  
ONKOLOGIYA in Russian Vol. 15 No. 3, May-Jun 93  
(manuscript received 16 Sep 92) pp 57-60

[Article by D. P. Lindner, O. N. Stetsenko, L. V. Talanova, A. S. Ivanova, Ye. V. Sokolova, and K. Z. Kurbanov; Institute of Immunology, Russian Federation Ministry of Public Health, Moscow; Russian State Medical University, Moscow; UDC 616-006.81-085.275]

[Abstract] In this work, the three stages of tumor development—latent, settling, and progressive—were modeled by means of grafting melanoma B16 cells ( $2 \times 10^4$  and  $1 \times 10^6$ ) to C57BL/6 strain mice. With the injection of myeloid (250 µg and 300µg at doses of 50 µg/day), inhibition of tumor development was noted to be long term in the first two stages and short term in the third. Structural characteristics of T-system activity in the thymus and regional draining lymph nodes were studied by means of morphometry. It was shown that in the latent and settling stages, lymphocyte generation was activated in the T-system. Myeloid did not affect this parameter, but it reduced the number of lost cells. In the progressive stage of tumor growth, a T-immunodeficiency rapidly developed after activation of lymphocyte generation. Myeloid initially intensified the generation of cells in the thymus; however, it did not prevent the subsequent development of the T-deficiency. Figures 4; references: 7 Russian.



### Collaboration Between Kazan Republican Center for Emergency Medicine and Medical Corps at Local Garrison

947C0187A Moscow ZDRAVOOKHRANENIYE ROSSISKHOY FEDERATSII in Russian No.9, 1993 (manuscript received 13 May 92) pp 6-8

[Article by Yu.F. Mayorov, Chair of Military Medicine, Kazan Institute for Advanced Training of Physicians imeni V.I. Lenin; UDC 614.88-082]

[Abstract] An outline is provided of the fundamental criteria that must be met to ensure full collaboration between the Kazan Republican Center for Emergency Medicine and the medical corps of the local garrison in catastrophic situations. Emphasis is placed on the need for preparedness, pre-planning, and delineation of duties and responsibilities of the different components of the system. Only then can the available human and material resources be utilized to the fullest for saving lives, providing adequate medical care, and preserving an acceptable level of public health services. Without such planning a coordinated, timely and rational response is virtually impossible.

### Cancer Statistics in Western Siberia

947C0188A Moscow ZDRAVOOKHRANENIYE ROSSISKHOY FEDERATSII in Russian No.8, 1993 (manuscript received 04 Feb 93) pp 10-13

[Article by L.F. Pisareva, V. Vasilyev and L.T. Filimonova, Scientific Research Institute of Oncology, Tomsk Scientific Center, Siberian Department, Russian Academy of Medical Sciences; UDC 616-006.04-036.2-07-313.13(571.1)]

[Abstract] A survey of cancer statistics for the 1980-1990 decade in Western Siberia has shown an overall pattern of increase in morbidity and mortality, consonant with the pattern of the rest of the Russian Federation. The changes affected both the urban and—especially—the rural areas of the 5 regions under consideration: Altay Kray and the Kemerovo, Novosibirsk, Tomsk and Omsk oblasts. Considerable variation was evident among the territories, with the maximum increase (24.2%) seen in the Tomsk Oblast and the smallest increment (6.0%) in Kemerovo Oblast. In general, the incidence of gastric and uterine cancers diminished during the decade, but lung, breast and hematopoietic malignancies and resultant deaths were on the increase. These changes in cancer epidemiology signal that the pattern in Western Siberia is beginning to approximate that evident in the Russian Federation as a whole. In addition to industrial pollution and other anthropogenic factors, global etiologic factors must also be considered in assessing the changing patterns evident in Siberian cancer epidemiology. Tables 1; references: 8 (Russian).

### Triiodothyronine in the Formation of the Adaptation Syndrome at Various Altitudes

947C0174 Almaty ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian No.6, Jun 93 pp 20-22

[Article by A. Zh. Mazakova, A. B. Burkashov, A. O. Ulubekova, P. K. Kazymbetov, Kazakh Institute of Physical Culture, Almaty; UDC 616.003.96+796.071.21+612.014.464]

[Abstract] One of the hormones characterizing the functional state of the thyroid gland is triiodothyronine, which has a strong influence on the body's growth and development and on the regulation of metabolism. The nature of that hormone's variation in terms of content and role in the context of the body's adaptation to muscle activity is not certain. That fact that, however, the absolute rate of degradation of triiodothyronine increases as thyroxine decays in individuals undergoing training on a regular basis and the additional fact that, in the context of one-time physical exertion, the dialyzing fraction of triiodothyronine drops suggests that the hormone is used primarily by tissue cells during adaptation to physical exertion. This paper studies the dynamics of the variation in serum triiodothyronine levels in 11 groups of white outbred rats kept at various altitudes. The research demonstrated moderate activation of the hormone during the period of acute adaptation to hypoxia. The fluctuations were identical for high levels of exertion as they were for the middle altitudes. Activation of the thyroid as a result of hypoxia stems from the need to accelerate the resynthesis of ATP, which supplies energy to the body. Antioxidant adjustment facilitated the onset of the adaptation state in the body with smaller energy expense, which was confirmed by the reduced range of variation of triiodothyronine among the groups. References 3 (Russian).

### Thirty Year Physical Development Dynamics of Rural Schoolchildren in Vitebsk Oblast

947C0166C Minsk ZDRAVOOKHRANENIYE BELARUSI in Russian No. 3, Mar 93 pp 52-57

[Article by G.F. Berenshteyn, M.N. Nurbayeva, A.G. Karavayev, D.A. Polevoy, N.I. Vasilenko, T.P. Karnoushenko, I.D. Borisenko, Vitebsk Teachers Institute; UDC 612.66:572.5(-22)(476.5)]

[Abstract] The child growth acceleration observed in many countries during postwar years and reports that these trends are stabilizing in Belarus and other regions prompted a study of the peculiar features of physical development of today's schoolchildren and attempts to determine the growth trends of the past 30 years. To this end, 1,663 boys and 1,788 girls aged 6-17 with health status I and II were examined in 17 rayons of Vitebsk oblast between 1989 and 1991; in so doing, such somatometric and physiometric indicators as body length, body mass, and chest circumference were measured, and statistical data were processed on an Elektronika MK-52

computer using variational statistics methods. The findings were compared to similar data for 1961-1963 and 1976-1977. An analysis demonstrates that the acceleration process is continuing in today's children and adolescents; it has been manifested most markedly among upper classmen in the past 15 years. The acceleration peak among rural schoolchildren falls at the second half of the 1970s. The growth trend slowed down in the 1980s, especially for the body length. The difference between the growth rates of urban and rural kids in the late 1980s and early 1990s is noted. Tables 5; references 12.

#### **Effect of Radiation Factor on Organism's Adaptability**

947C0166A Minsk ZDRAVOOKHRANENIYE  
BELARUSI in Russian No. 3, Mar 93 pp 7-11

[Article by O.P. Shepelin, Vitebsk Medical Institute; UDC 612.014.482:616-003.96]

[Abstract] Proven negative effects of low level radiation on humans (despite assertions to the contrary), especially the effect of long-lived radio-nuclides on the reproductive organs and the danger it poses to the genetic stock of the Belarus republic, and a lack of data on the principal intermediate link of the illness-health chain, i.e., the predisease state which determines the bounds of the organism's adaptability to the man-caused radiation factor, have increased the urgency of investigating the effect of this factor on the body's adaptability after the mothballing of the Chernobyl plant. Researchers' suggestions of establishing an 8.8 mSv safe lifetime bone marrow level for estimating the delayed radiogenic bio-effects is criticized. While not denying the need for more profound studies of the radiation factor on the humans, especially the neuroendocrine and immune systems, and searching for new ways of improving regulatory practices, the concept of adaptation to radionuclides proposed by others is dismissed as unsound since it involves not only a medical and biological threat to the organism but may mediate in complicating the solution to a broad range of acute socioeconomic problems of the population in contaminated areas. Attention is focused on the specific features of the biological impact of radionuclides above natural background levels which complicates preventive delineation between adaptation, prepathology, and the disease itself. References 18: 17 Russian, 1 Western.

#### **Peculiarities of Ultrasonic Thyroid Gland Pattern in Children and Adolescents Exposed to Radionuclides**

947C0166B Minsk ZDRAVOOKHRANENIYE  
BELARUSI in Russian No. 3, Mar 93 pp 11-15

[Article by L.N. Astakhova, V.F. Kozyrev, V.M. Drozd, M.I. Garshanov, Scientific Research Institute of Radiation Medicine at the Belarus Republic Ministry of Public Health; UDC 616.441-053.2/ 7-073.48:612.014.482 (476.2)]

[Abstract] The urgency of early detection of thyroid gland diseases by ultrasonic examination methods (UZI) in the aftermath of the Chernobyl power plant accident and the ensuing radioactive contamination of the southern parts of Belarus prompted an investigation into the peculiar features of ultrasonic echo pattern and the proliferation of nodal thyroid gland formations in children and adolescents exposed to radioactive iodine who are residing in the areas with endemic goiter. To this end, 768 boys and 809 girls aged 6-17 from the town of Vetka (781) and Vetka rayon (796) of Gomel oblast and 762 kids in a control group from Braslav in Vitebsk oblast were screened. The study involved examination by an endocrinologist and ultrasonic testing using the Hitachi-310 and Siemens devices. The structure of echo symptomatology based on an ultrasonic examination of the thyroid gland are summarized. An analysis reveals that ultrasonic pattern deviations were more frequent in the target group than in control group, i.e., 23.1% vs. 17.9% ( $p < 0.05$ ) whereby the leading symptom was a decrease in the echoing ability (16.7% vs. 12.2%). The runner up group was comprised of patients with a nonuniform thyroid gland tissue structure (6.2% vs. 1.1%) while dilation of vessels was more frequent in the control group (6.0% vs. 2.8%). The rate of nodal thyroid gland pathology exceeded 15 per mil and thyroid cancer—2.54 per mil. The mean absorbed radiation dose in Vetka was 45 cGy and in Vetka rayon—120 cGy. Tables 1; references 7.

#### **Technique for Decontaminating Milk Contaminated With Radionuclides of Cesium**

947C0184A Moscow GIGIYENA I SANITARIYA  
in Russian No.9, Sep 93 [manuscript submitted  
14 Aug 91] pp 34-36

[Article by A. Ye. Romanenko, V. N. Korzun, L. A. Ilin, V. P. Borisov, L. S. Galbraykh, N. G. Kononovich, L. A. Nazarina, B. A. Popov, V. I. Saglo, Ye. V. Arzhanova, Science Center for Radiation Medicine, Kiyev; Institute of Biophysics, Moscow; Moscow Textile Institute; UDC 614.31:637.1:546.36]

[Abstract] Radioactive cesium, the most hazardous of the radionuclides in terms of internal irradiation, enters the body primarily with milk. Agrochemical measures to prevent the transfer of the radionuclide via milk, however, are not effective, and reprocessing fails to remove the cesium completely. The use of complexones, ion-exchange resins, and clays affect chemical composition and nutritional value, reducing the amounts and quality of proteins, vitamins, and mineral salts. The researchers here have developed a technique for producing the chemisorbent fiber TsM-KF, which is intended for use in filters employed in removing cesium radionuclides from milk and other fluids on private farms. The technique uses ferrocyanides, but prevents the fine-disperse fractions from migrating to the milk. Mtilon-V, a copolymer of cellulose and polyacrylonitrile, is used effectively as the fiber matrix and keeps the ferrocyanides in the fiber structure. The optimum filtration rate (about 1

l/min) can be achieved for a filter with a density of 500 g/sq m and an area of 144 sq cm. The efficiency of the filtration of milk was found to average 90 percent. References 29: 17 Russian, 12 Western.

### Anti-microbial Materials for Prevention of Intrahospital Infection

947C0184B Moscow GIGIYENA I SANITARIYA in Russian No.9, Sep 93 [manuscript submitted 28 Jan 93] pp 45-47

[Article by A. V. Sedov, T. B. Ryazantseva, O. R. Mikhaylov, T. I. Tregub, B. P. Iashvili, N. I. Tsutskiridze, STsEMP [not further expanded] Zashchita, Russian Ministry of Health, Moscow; Scientific and Practical Center for Thermal Burns, Georgian Ministry of Health, Tbilisi; UDC 616.9-022/369-078]-084]

[Abstract] One promising means of preventing intrahospital infection is the use of patient garb and bedclothes made of antimicrobial material. The researchers here studied the use of materials containing polyhexamethyleneguanidine (PHMG)—a broad-spectrum antiseptic that is fivefold more active than phenol and twofold more active than chloramine—in surgical and burn units. Clinical tests were performed in the Department of General Surgery of the Sechenov Moscow Medical Academy (clinical hospital No. 23) and the Georgian Science and Practical Center for Thermal Burns. Microbial dissemination in the PHMG materials, after 15 washings, was five times higher in normal garb and bedclothes. Pyoseptic complications were reduced (by half in one group of burn patients), and hospital stay dropped from 22 bed-days to 20. In patients with moderately severe burns, bed-days went from 65 to 52. References 6: 5 Russian, 1 Western.

### Morphofunctional Characteristics of Malignant Thyroid Gland Tumors in Children From Various Ukrainian Regions Affected by Chernobyl Nuclear Power Plant Accident

947C0185A Moscow ARKHIV PATOLOGII in Russian Vol. 55 No. 5, Sep-Oct 93 pp 55-60

[Article by Yu.N. Zurnadzhi (deceased), T.I. Bogdanova, N.D. Tronko, S.I. Rybakov, Ya.M. Cherniy, I.V. Komissarenko, Ye.V. Bolshova, V.A. Oleynik, Ye.V. Epshteyn, V.A. Shakhmatova, Kiev Scientific Research Institute of Endocrinology and Metabolism at the Ukrainian Public Health Ministry; UDC 616.441-006.04-053.2-02:614.876]-076.5(477)]

[Abstract] The urgency of obtaining complete information about the rate of thyroid gland diseases among children, especially the malignant forms, and in so doing, utilizing a comprehensive pathological, pathomorphological, and ultrastructural approach for the purpose of setting up a database prompted an analysis of statistical data from 25 oblast public health offices in Ukraine on the incidence of malignant thyroid gland tumors in

children (under 14) and adolescents (15-18 year old) during 1981-1990 and pathohistological (33 cases) and electron microscopy (20 cases) studies of biopsy substrates of thyroid carcinoma in children operated in 1989-1991 at the Scientific Research Institute of Endocrinology and Metabolism. The thyroid cancer growth dynamics in Ukrainian children before and after the Chernobyl nuclear power plant accident are plotted, and the number of thyroid cancer cases in Kiev and Kiev, Chernigov, and Zhitomir oblasts is summarized. According to preliminary data, the incidence of thyroid carcinoma in children under 14 rose from 0.04-0.06 in 1981-1988 to 0.23 in 1990 (per 100,000) while total absorbed thyroid gland irradiation doses in children operated in 1990 varied within 2-300 cGy. The rate of thyroid cancer rose from zero in the pre-accident period to 0.36 in Kiev, 0.72 in Kiev oblast, 1.1 in Chernigov oblast, and 0.6 in Zhitomir oblast (per 100,000). Comprehensive studies using ultrastructural analysis methods make it possible to expand the diagnostic criteria and serve as the basis for setting up a cancer database. Figures 4; tables 1; references 15: 5 Russian, 10 Western.

### Outcome of Cytogenetic Examination of Chernobyl Nuclear Power Plant Accident Cleanup Crew Members Five Years Later

947C0179A Moscow MEDITSINA TRUDA I PROMYSHLENNAYA EKOLOGIYA in Russian No 11-12, Nov-Dec 93 pp 34-36

[Article by G.P. Snigireva, N.P. Lyubchenko, V.A. Shevchenko, N.N. Novitskaya, N.M. Borisova, Ye.B. Dubinina, V.G. Maslennikova, General Genetics Institute at Russia's Academy of Sciences, Diagnostics and Surgery Institute at the Russian Federation Ministry of Public Health, and Oblast Scientific Research Clinical Institute imeni M.F. Vladimirovskiy, Moscow]

[Abstract] The long latent period of radiation-induced cancer (from five to 40 years) and the lack of data on the dose absorbed by some members of the Chernobyl accident cleanup (LPA) crew as well as the ambiguity of published reports of cytogenetic examinations of accident cleanup crew members prompted an analysis of a cytogenetic study carried out five years after the accident. To this end, 69 men aged 24 to 59 and a control group of 19 persons were examined; the target group was divided into three categories: crew members who worked in May-Aug 86; crew members who worked in late 1986-early 1987; and crew members who worked in 1987. The absorbed irradiation dose was not known for 19 target group members. The frequency of chromosomal aberrations in peripheral blood lymphocytes among cleanup crew members is summarized. The findings demonstrate that the rate of aberrations in group 1 exceeded that of the control group by almost twofold while the rate in groups 2 and 3 was also higher albeit less markedly so: 68% in group 2 and 78% in group 3. An analysis confirms the high incidence of aberrations due to the radiation exposure. The results make it possible to speculate that the mean absorbed irradiation dose was at



least 250 mSv; these are the people who worked during the first six months after the accident. Moreover, the observed cytogenetic effect should be treated as an indicator of the degree of risk of developing future genetic component pathology, including cancer. Tables 1; references 12: 7 Russian, 5 Western.

## PHARMACOLOGY AND PHYSIOLOGY

### Growth Stimulation in Dissociated Rat Embryo Spinal Marrow Culture Cells Under Effect of Dalargin Opioid Peptide and Naloxone Opioid Receptor Blocker

947C0142B St. Petersburg TSITOLOGIYA in Russian  
Vol. 35 No. 9, Sep 93 pp 66-68

[Article by V.U. Kamenchuk, Experimental Cardiology Institute at the Cardiology Research Center of Russia's Academy of Medical Sciences, Moscow]

[Abstract] The role of opioid peptides as nerve tissue growth factors and the effect of naloxone—an opiate receptor blocker—on the neuron survival in the central (TsNS) and peripheral (PNS) nervous system is discussed, and an attempt is made to ascertain whether naloxone, either alone or in combination with opioids, is capable of affecting the spinal cord cells in a reaggregated culture. To this end, a culture of 14-day old Vistar rat embryo spinal marrow is examined. The experimental procedure is outlined. Cell aggregates formed in the cultures under study contained virtually no neurite-glial bundles on the third day, while the presence of dalargin—an opioid peptide—and naloxone induced the growth of neurite-glial bundles around the aggregate in cultures of this age. The effect of dalargin and naloxone on the cell aggregate area in the rat embryo cell culture on the third day is summarized. The study demonstrates an average 1.85-fold increase in the cell aggregate area under the effect of dalargin, a 1.78-fold increase under the effect of naloxone, and a 2.5-fold increase under the effect of both agents. This is attributed to an increase in the number of aggregate-forming cells; it is speculated that this is due to an increase in the survival of the cells partially damaged as a result of dissociation and to an increase in the degree of their adhesive properties. This confirms that not only opioid peptides but also the opiate receptor blocker affect the nerve tissue cell survival in the culture and their adhesion properties. Tables 1; references 13: 3 Russian, 10 Western.

### Proprioception of Low Frequency Acoustic Vibrations

937C0325B Moscow SENSORNYI SISTEMY  
in Russian Vol. 7 No. 2, Apr-Jun 93 (manuscript  
received 27 Jul 92) pp 31-39

[Article by L. D. Yenin, I. L. Potekhina, and G. N. Ponomarenko; Military Medical Academy, St. Petersburg; UDC 612.86]

[Abstract] The mechanisms of proprioception of low frequency acoustic vibrations were studied by means of registering the pulse activity of individual tibial nerve fibers belonging to the afferent muscle group. The action of these vibrations led to definite changes in the frequency of pulse activity, its temporal structure, and the activation of "silent" receptors. Threshold energy flux densities of stimuli that resulted in muscle spindle responses were 0.1 mV/m<sup>2</sup> for primary endings and 1 mV/m<sup>2</sup> for secondary endings. Reaction dependence on stimulus intensity was approximated by a logarithmic function. Low thresholds of sensory perception, as well as the nonlinear character of reactions to low frequency acoustic vibrations, indicated the direct participation of afferent muscle nerve fibers in their somatosensory perception. Variation in proprioceptor sensitivity was governed by the topography of nerve endings and differences in the mechanical properties of muscle spindles. Figures 4; references 13: 8 Russian, 5 Western.

### Human EEG Fine Structure at Varying Frequencies of Sensory Stimulation

937C0325C Moscow SENSORNYI SISTEMY  
in Russian Vol. 7 No. 2, Apr-Jun 93 (manuscript  
received 20 Jan 92) pp 59-66

[Article by A. I. Fedotchev and A. T. Bondar; Institute of Cell Biophysics, Russian Academy of Sciences, Pushchino; UDC 612.821]

[Abstract] A comparative analysis of EEG fine structure dynamics while individuals were subjected to intermittent sound and light stimuli at a continuously varied frequency (1-15 Hz) was conducted. Sound stimulation at varying frequencies of intermittent activity affected activation of spectral components of only the  $\alpha$ -region of the EEG (8-12 Hz), characteristic of the rest EEG. Light flashes were accompanied by resonance amplification of specific spectral components in all regions of the EEG, but only when their frequency was coincident with that of photostimulation. It was proposed that sound stimulation with a changing frequency of intermittent activity causes synchronization of uncorrelated sources of EEG spontaneous rhythm, whereas light identifies brain oscillators with potentially high resonance activity. The authors conducted this study as part of an effort to develop new approaches toward controlling human behavior and conditions. Figures 3; references 21: 11 Russian, 10 Western.



**Effect of Regulator Peptide on the Human Field of Vision and Acuity**

937C0325D Moscow *SENSORNYE SISTEMY*  
in Russian Vol. 7 No. 2, Apr-Jun 93 (manuscript  
received 30 Mar 89) pp 76-82

[Article by L. A. Katsnelson, R. F. Yeliseyeva, O. B. Ilyinskiy, N. B. Kostelyanets, I. A. Shevelev, G. I. Dnestrova, and M. I. Titov; Institute of Eye Diseases imeni Gelmgolts, Russian Ministry of Public Health, Moscow; Institute of Higher Neural Activity and Neurophysiology, Russian Academy of Sciences, Moscow; UDC 612.821.8] [Abstract] Visual acuity, the field of vision, and spatial-frequency sensitivity were studied in

patients with pigment degeneration of the retina before and after treatment (immediately and after 1, 3, and 6 months) with dalargin, a leucine-enkephalin analogue. Significant improvement in the spatial-frequency sensitivity (93% of patients) and visual acuity (73%) was considered an indicator of intensification of lateral inhibiting effects that had been weakened by disease. Cases of continued improvement in these functions over time and increased field of vision (in 20% of the patients) were discussed as evidence of an indirect triggering effect of the neuropeptide on endogenic mechanisms of the recovery of visual functions and structures. Figures 2; references 27: 17 Russian, 10 Western.

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